Foreign Technology Alert—Bibliography

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JAN 21 1983
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TRANSPORTATION SAFETY

by Dr. Gordon Wilkinson

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TRANSPORTATION SAFETY

Alerting US readers to foreign technology on the safety aspects of ground and air transportation was the objective of this study. A tailored search was performed of the NTIS bibliographic data base and covered some 187 documents added to the collection between January 1980 and May 1982.

The output has been systematically organised into the major headings:

GROUND TRANSPORTATION

Traffic Engineering and Safety
Accident Research & Investigation
Hazards and Accident Prevention
Human Factors
Pedestrian Safety
Motor Vehicles
Motor Cycles & Pedal Cycles

AIR TRANSPORTATION

Traffic Control & Aviation Safety
Accident Research & Investigation
Hazards and Accident Prevention
Rescue Systems

The majority of the foreign technology originates from Western Europe, particularly the Transport and Road Research Laboratory in the UK. Other important sources are Sweden, Norway, Germany, the Netherlands and South Africa. Most reports are in their original language, and titles are annotated accordingly.

Each section is cross-referenced so that no relevant abstracts are missed. Extensive subject and author indexes are provided to ensure the maximum usefulness of this bibliography.

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15. Supplementary Notes

Citations from the NTIS data base (187).

16. Abstract (Limit: 200 words)

This document provides a systematically organised collection of abstracts from the NTIS bibliographic data base relating to Transportation Safety and describes work originating from countries outside the USA. A tailored search of the data base was performed and the output carefully categorized, edited and indexed. Some 75 per cent of the reports described deal with safety aspects of ground transportation; the remainder are on air traffic safety. The majority of the foreign technology originates from Western Europe, about half of this being from the Transport and Road Research Laboratory in the UK. Other important sources of technology referred to in the report include: National Swedish Road and Traffic Research Institute, Institute for Transport Economics (Norway), Institute of Road Safety Research (Netherlands) and National Institute for Transport and Road Research (South Africa). Most reports are in their native language, but titles are annotated to advise readers of non-English texts. A proportion of foreign language documents have author abstracts and summaries in English. Major subject headings include: GROUND TRANSPORTATION – Traffic Engineering and Safety; Accident Research and Investigation; Hazards and Accident Prevention; Human Factors; Pedestrian Safety; Motor Vehicles; Motor Cycles and Pedal Cycles; AIR TRANSPORTATION – Traffic Control and Aviation Safety; Accident Research and Investigation; Hazards and Accident Prevention; Rescue Systems. Each of the 19 sections in the book is cross-referenced; there is also an author index and useful subject index based on major descriptors.

17. Document Analysis a. Descriptors

*Bibliographies; *Document announcement; *Traffic Safety; Accident investigations; Aviation safety; Air transportation; Highway transportation

b. Identifiers/Open-Ended Terms

*Foreign technology

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FOREIGN TECHNOLOGY ALERT

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GROUND TRANSPORTATION

TRAFFIC ENGINEERING & SAFETY

TRAFFIC CONTROL

03001 Cure or Improvement – The Organization of Police between Safety and Efficiency in Traffic (Bot Eller Bedring – Politiets Organisasjon – Mellom Sikkerhet og Effektivitet i Trafikken) *(in Norwegian)*

Lorentzen, Hakon
Transportoekonomisk Inst., Oslo (Norway). Jun. 78; 71p.

Order as: **PB82-155102**; PC A04/MF A01

The report deals with the traffic related work of the police in a sociological framework and analyzes how formal and informal expectations from important segments of society tend to shape this work. The study also contains an analysis of how the police organization and the general relations to the public, authorities and the road users tend to direct the traffic work towards a few well defined, problem areas.

03002 Developing New Traffic Control Methods – Results of a Survey (Trafikanters Holdning Til Nytt Traffikkteknisk Utstyr – Resultater fra en Gallupundersoekelse) *(in Norwegian)*

Gabestad, Knut O.; Amundsen, Finn H.
Transportoekonomisk Inst., Oslo (Norway). Jun. 79; 57p.

Order as: **PB82-149535**; PC A04/MF A01

The report gives the results from an interview among 820 car-drivers. They were all asked to evaluate different new methods to increase traffic safety.

03003 Intersections of the Main Road System: The Structure of the Analysis Register (Vaegkorsningar pa Huvudvaegnaetet: Analysregistrets Uppbyggnad) (Report No. VTI/Meddelande 211) *(in Swedish)*

Larsson, Joergen; Bruede, Ulf
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 53p.

Order as: **PB82-110529**; PC A04/MF A01

An analysis register with the individual intersection as observation unit has been created for a project for the study of traffic safety. Data have been obtained from a 1977-1978 national inventory of all intersections of the national road system. The analysis register involves 6247 intersections with 3 or at the most 4 entrances. Each intersection is represented by 10 punch cards with 80 positions each. 2 cards include processed data about the road construction, traffic flow, traffic control, speed limits, pavement width as well as information regarding possible side constructions or bus stops. There is also information regarding the most recent changes affecting the traffic of the intersection. The remaining cards represent data divided up based on season, road and light conditions as well as a division based on up to 22 conflict types and in some cases 5 accident types.

03004 Annual Report 1978/79 *(in Swedish)*

Anon.
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 135p.

Order as: **PB81-141673**; PC A07/MF A01

Contents: The duties and organization of the National Swedish Road and Traffic Research Institute; The 'Road transport planning' program; The 'Roads' program; The 'Vehicle' program; The 'Road user' program; The 'Traffic process' program; Information and documentation activities; The technical section of the administrative division; The ADP section of the administrative division; Seminars arranged by the Institute; International collaboration; Collaboration with universities and colleges; and Finances.

03005 Transport and Handling of Dangerous Goods. Training of Persons in Charge of Vehicles or Vessels Carrying Dangerous Goods by Road or by Inland Waterways (Dangerous Goods 1979 No. 1) *(in French)*

Anon.
15 Mar. 79; 3p.

Order as: **INIS-mf-5552**; PC A02/MF A01. U.S. Sales Only.

This Order supplements the Regulations of 15 April 1945 on the transport of dangerous goods by rail, land and inland waterways. It deals with the training of persons in charge of vehicles or boats carrying dangerous goods by road or by inland waterways. It refers in particular to transport of radioactive materials. (Atomindex citation 11:514700)

03006 Ministerial Order of 23 May 1977 Granting a General Derogation from the Royal Order of 15 March 1976 on the Transport of Dangerous Goods by Road with the Exception of Explosive and Radioactive Materials *(in French)*

Anon.
7 Jul. 77; 1p.

Order as: **INIS-mf-5544**; PC A02/MF A01. U.S. Sales Only.

This Order grants a general derogation from the 1976 Royal Order on the carriage of dangerous goods by road with the exception of explosive and radioactive materials. (Atomindex citation 11:514699)

03007 Effects of a Lorry Control at Lym, Cheshire (TRRL Supplementary Report No. 556)

Christie, A. W.; Prudhoe, J.
Transport and Road Research Lab., Crowthorne (England). c1980; 23p.

Order as: **PB81-100612**; PC A02/MF A01

TRRL has monitored a lorry control at Lymm, Cheshire which has diverted some 220 heavy lorries per day, many carrying dangerous loads, away from the narrow tortuous and hilly roads through the village. Although the main aim of the control is to reduce the possibility of major accidents involving large vehicles carrying hazardous loads through Lymm it has not proved possible to evaluate its effect on the probability of such accidents occurring there or elsewhere. The diverted vehicles now use better, but longer, routes at an extra cost. They now pass more dwellings than formerly but, in

general, the individual HGV flow increases are less than the individual flow decreases and are on roads which already carried much greater total traffic flows.

03008 Roundabout Capacity: Public Road Experiment at Wincheap, Canterbury (TRRL Supplementary Report No. 554)

Semmens, Marie C.; Fairweather, P. J.; Harrison, I. B.
Transport and Road Research Lab., Crowthorne (England). c1980; 25p.

Order as: **PB80-227952**; PC A02/MF A01

A public road experiment at the '4-arm' junction A2/A28 (Wincheap Roundabout, Canterbury) has been carried out to compare the capacities of two alternative offside priority roundabout designs. As expected, higher capacities were obtained with the design having wider entries combined with a reduced island size. Closing one arm of the roundabout had only a small (and not statistically significant) effect on the full capacity. Possible effects on the individual entry capacities of the number of entries queueing and of the flow leaving the roundabout by the previous exit were investigated; neither effect was found to be significant. Entry capacity relationships obtained from the data by linear regression were used to test a roundabout capacity balancing computer program by comparing the predicted operating capacities with those observed. The results showed close agreement. (Copyright (c) Crown Copyright 1980.)

03009 Area-Wide Measures in Urban Road Safety (TRRL Supplementary Report No. 517)

Dalby, E.
Transport and Road Research Lab., Crowthorne (England). c1979; 21p.

Order as: **PB80-158959**; PC A02/MF A01

Outside central areas only a relatively small proportion of urban accidents may occur in clusters sufficiently large to justify the use of site-specific engineering remedies. Low-cost measures, combined to produce an area-wide effect are already used in environmental improvement schemes to discourage through-traffic from entering residential streets, to reduce the speed of access traffic and to make drivers more aware of the dangers inherent in the residential environment. The data available suggest that the same measures might be effective in reducing accidents, not only on residential streets but also on arterial routes. (Copyright (c) Crown Copyright 1979.)

03010 In Search of a New Capacity Formula for Conventional Roundabouts. (Laboratory rept. TRRL-LR-773)

Philbrick, M. J.
Transport and Road Research Lab., Crowthorne (England). 1977; 38p.

Order as: **PB-280 519/0SL**; PC A03/MF A01

Traffic flow data from 21 roundabout 'weaving' sections have been analyzed to check the validity of Wardrop's formula for the design of conventional roundabouts, and to search for improved methods of capacity prediction. On average, capacities were eight per cent below the 'practical capacity' predicted by Wardrop's formula. The proportion of weaving traffic made no significant contribution to accuracy: with this factor removed a revised version of the formula was developed, and has already been published in the Department of the Environment Technical Memorandum H2/75. Further work centered round the fitting of a linear relationship between traffic entering the roundabout from a saturated approach, and that already in the circulating carriageway. The relationship was defined by the intercept on the entry flow axis and the slope, which was almost always significantly shallower than-1. Regression techniques were used to develop provisional equations predicting, from the geometry of each section, values for the intercept and slope. Results showed a moderate (but non-significant) improvement over the original and revised versions of Wardrop's formula in terms of between-sites variation, and a considerably improved representation of the within-sites variation. Further checks will be made against more data now being obtained. (Copyright (c) Crown Copyright 1977.)

03011 Crawler Lane Construction on M5: The Use of Narrow Lanes. (Laboratory rept. TRRL-LR-782)

Maclean, A. D.; Greenway, M.
Transport and Road Research Lab., Crowthorne (England). 1977; 29p.

Order as: **PB-280 517/4SL**; PC A03/MF A01

During the construction of a crawler lane at two gradients on M5 motorway in 1975, two lanes were kept open to traffic up the gradient by re-marking the carriageway with sub-standard lane widths. The effects of the reduced lane widths on traffic flow were minimal, although advisory speed limits on the sites probably reduced the speed of traffic on the gradients and their approaches. The traffic delays averaged only 12 veh-h/h when the narrow lanes were operating. Later in the work, lane closures and two-way operation restricted the uphill traffic to only one lane and produced considerable delays as a result (up to 112 veh-h/h). Consequently, when it was necessary to close one of the carriageways during the final stages of the work, a system of two-way operation using narrow lanes was implemented. This system provided two lanes for traffic up the gradients, and reduced the delays to 53 veh-h/h. The effects of the different methods of operation on accidents and traffic diversion are examined. The completed crawler lanes resulted in journey-time reductions of 0.15 and 0.74 minutes (over a total journey-length of 5.7 km, for light and heavy vehicles respectively). (Copyright (c) Crown Copyright 1977.)

SEE ALSO: 03032; 03033; 03122; 03150

TRAFFIC SIGNS & WARNING SYSTEMS

03012 Optical Guiding in Road Curves: Institute of Transportation Economics Project Report (Optisk Ledning i Vegkurver: En Empirisk Undersoekelse av Hvordan Skilter og Oppmerking Pavirker Fart og Kjoeretoeyplassering) *(in Norwegian)*

Amundsen, Finn Harald; Pedersen, Trond Olaf
Transportoekonomisk Inst., Oslo (Norway). Jun. 76; 37p.

Order as: **PB82-155557**; PC A03/MF A01

The report describes how five different kinds of curve markings influenced the road users choice of speed and position of the vehicle in the traffic lane. Measurements of speed were done with six magnet detectors in each of four curves under both day and night visibility conditions.

03013 Yellow Bar Experimental Carriageway Markings – Accident Study (Report No. TRRL-LR-1010)

Helliar-Symons, R. D.
Transport and Road Research Lab., Crowthorne (England). c1981; 22p.

Order as: **PB82-135328**; PC A02/MF A01

Analysis of accidents at 42 roundabouts at which Yellow Bar experimental carriageway markings had been laid on an approach road, showed an overall reduction in the proportion of speed-related accidents on these approach roads of 57 per cent. The markings appeared to be most effective in reducing fatal and serious injury accidents, while still reducing slight injury accidents. They were more effective in daylight than after dark and appeared to be most effective when the road surface was wet, rather than dry. They were highly cost-beneficial and the accident reduction was maintained at seven pilot sites for which data for four years after installation were available. (Copyright (c) Crown Copyright 1981.)

03014 The Effect of an Advisory Speed Signal on Motorway Traffic Speeds (TRRL Supplementary Report No. 615)

Webb, P. J.
Transport and Road Research Lab., Crowthorne (England). c1980; 14p.

Order as: **PB81-160186**; PC A02/MF A01

The effect on vehicle speeds of a rural motorway matrix signal, displaying a 50 mile/h advisory speed limit, was measured on M4 in both wet and dry weather. When the speed limit was displayed the mean car speed at the test site reduced from 72.1 mile/h to 67.2 mile/h in dry weather, and from 70.6 mile/h to 67.9 mile/h in wet weather. When corrected to allow for speed changes at the control site, these reductions correspond to 4.8 per cent and 4.9 per cent respectively. Heavy vehicles were little affected by the signal-their normal speed was not much higher than the advisory limit. The average speed of vehicles was between 5 mile/h and 11 mile/h higher than those measures in a similar trial on M1. furthermore, speed reductions in response to the signal were much smaller on M4. These differences were mainly due to a slight difference in gradient and the higher flow of M1. A modified signal, giving drivers more information than at present, is being tested in an attempt to improve drivers' response. (Copyright (c) Crown Copyright 1980.)

03015 Skyddsanordningar och Foerhands information vid Fast Vaegarbete pa Motorvaeg. Effekter pa Fordonshastighet och Koerfaeltsbyte (Protective Devices and Preliminary Information on Permanent Road Works on Motorways. Effects on Vehicle Speed and Lane Changing) (Report No. VTI-179) *(in Swedish; Abstract and Summary in Swedish and English)*

Oeberg, Gudrun
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1979; 67p.

Order as: **PB81-129736**; PC A04/MF A01

Present methods for reducing vehicle speeds in conjunction with road works are insufficient with regard to demands on road worker protection and traffic safety. The National Swedish Road and Traffic Research Institute investigated how the following warning systems influence speeds and lane changing: A section change sign indicating which lane is free along the road works; A narrower land (3.15 m) with two different entrances at the beginning of the road works; and A large cone (plinth) replacing the normal cones. These warning systems have been combined in different ways. When narrower lanes the speed limit along the road works was 110 km/h against 50 km/h in other cases. The results with regard to speed and lane changing were compared with the results obtained with signs agreeing with the recommendations of the National Swedish Road Safety Office.

03016 Prov Med Hastighetsdaempande Gupp i Vaegbanan pa tre Gator i Goeteborg (Speed Reducing Bumps. Tests in Three Streets in Gothenburg) (Report No. VTI-176) *(in Swedish. Abstract and Summary in English)*

Pettersson, Hans-Erik
National Swedish Road and Traffic Research Inst., Linkoeping. 1979; 106p.

Order as: **PB81-128332**; PC A06/MF A01

Speed reducing bumps were installed in the streets of three different types of residential areas. The vehicle speeds were reduced considerably while the variation of speed was increased. Regarding noise, pedestrian behaviour and vibrations in the ground and in house foundations the effects were very small. From answers to a questionnaire distributed to the domestic areas close to the places of installation were found that people in general approved of the bumps.

03017 Recognition Distances and Understanding of Legends on an Experimental Motorway Signal (TRRL Supplementary Report No. 500)

Rutley, K. S.; Webb, P. J.
Transport and Road Research Lab., Crowthorne (England). c1979; 20p.

Order as: **PB80-161375**; PC A02/MF A01

A new type of matrix signal is being considered to improve the effectiveness of the motorway signalling system. In addition to the advice given by the present signal, it would inform drivers of the nature and location of hazards. A prototype three-part signal has been built to display this information, and a number of pictograms have been designed for indicating the nature of the hazard. Measurements were made of the recognition distance of the three parts of the signal. The effect of a normal accumulation of road dirt on matrix signal recognition was assessed at the same time. The pictograms were tested to find out how

effective they were in conveying the desired meaning to drivers who had not seen them before. (Copyright (c) Crown Copyright 1979.)

03018 Results from Three Trial Installations of Rumble Areas (TRRL Supplementary Report No. 292)

Watts, G. R.
Transport and Road Research Lab., Crowthorne (England). c1978; 34p.

Order as: **PB-300 456/1SL**; PC A03/MF A01

Three trial installations of rumble ares to specifications developed by TRRL have been made and their effect on vehicle movements and driver behaviour assessed. The trial sites were all on A class roads and were on approaches to (1) a roundabout, (2) a bend and (3) a signal controlled crossroads. Small reductions in average vehicle speeds were observed and there were more marked reductions in the proportion of vehicles travelling at high speeds. Most drivers appeared to recognise the rumble areas as an intended warning device. The results were consideration to justify further trial installations at other sites. (Copyright (c) Crown Copyright 1978.)

03019 Roadworks on Trunk and Principal Roads: The Standards of Signing (TRRL Supplementary Report No. 372)

Maclean, A. D.
Transport and Road Research Lab., Crowthorne (England). c1978; 29p.

Order as: **PB-298 722/OSL**; PC A03/MF A01

Following considerable efforts in recent years by the Department of Transport to encourage an improvement in the standards of signing at roadworks, a survey of over 650 roadworks on Trunk and Principal Roads in the five-year period 1972-77 has shown that although the total numbers of signs used at each work have remained the same, there is some evidence that signs are used more selectively to give more information to motorists. Nevertheless, about 20 per cent of the main approaches to work sites remain with no useful advance signs - and the incidence of unsigned works is not confined only to minor works or those on low speed roads, although these account for the majority of the cases examined. For small statutory undertakers' works in particular, almost 40 per cent of the main approaches remain unsigned. The distances between works and their advance signs have not changed between 1972 and 1977; on average the Department's recommendations (Chapter 8 of the Traffic Signs Manual) are exceeded in this respect. (Copyright (c) Crown Copyright 1978.)

03020 The Effect of Motorway Signals on Traffic Speed (TRRL Supplementary Report No. 363)

Lines, C. J.
Transport and Road Research Lab., Crowthorne (England). c1978; 21p.

Order as: **PB-298 684/2SL**; PC A02/MF A01

The effect on vehicle speed of advisory speed indications shown on motorway signals has been measured at two sites on the M1 motorway. On an urban section of the motorway at Scratchwood in N London, measurements were made of vehicle speeds before and after a set of signals mounted over the carriageway on a gantry. The signals were set to show an advisory speed of 50 mile/h. Control measurements were also made with the signals switched off. The average speed of light vehicles in the right-hand lane was reduced from about 78 mile/h to 71 mile/h (9 percent); in the center lane from about 69 to 63 mile/h (7 1/2 percent); and in the left-hand lane from about 57 to 55 mile/h (4 percent). Similar measurements were made on a rural section of the motorway at Newport Pagnell where the single signals are mounted on posts in the central reservation. The average speeds of light vehicles in the right-hand lane was reduced from about 77 mile/h to 69 1/2 mile/h (9 1/2 percent); in the center lane from about 68 to 63 mile/h (7 percent); and in the left-hand lane from about 55 to 52 mile/h (5 percent).

03021 A Road Sign for Warning of Close-Following: Form and Message Design (TRRL Supplementary Report No. 324)

Robertson, Alec
Transport and Road Research Lab., Crowthorne (England). Prepared in cooperation with Lanchester Polytechnic, Coventry (England). Faculty of Art and Design. 1977; 20p.

Order as: **PB-284 504/8SL**; PC A02/MF A01

A survey was made of the opinion of drivers on designs for a road sign which warns them of their close-following behaviour. A film simulating the operation beside the road of each design of sign was shown to 100 randomly selected drivers. An assessment of the questionnaires showed that, although no particular design was outstanding, two were generally acceptable. (Copyright (c) Crown Copyright 1977.)

SEE ALSO: 03088; 03095

ACCIDENT RESEARCH AND INVESTIGATION

ACCIDENT RATES

03022 Registration of Traffic Conflicts (Registrering av Trafikkonflikter) *(in Norwegian)*

Amundsen, Finn Harold
Transportoekonomisk Inst., Oslo (Norway). Jun. 77; 41p.

Order as: **PB82-149485**; PC A03/MF A01

In this report a method to count traffic conflicts is described. The method is illustrated by examples.

03023 A Survey of Research into Relationships Between Traffic Accidents and Traffic Volumes (TRRL Supplementary Report No. 692)

Satterthwaite, S. P.
Transport and Road Research Lab., Crowthorne (England). c1981; 48p.

Order as: **PB82-142738**; PC A03/MF A01

Previous research into relationships between road accident frequencies and traffic volumes is reviewed. Methods used are assessed and the main conclusions of the soundest studies drawn together. Some researchers have deduced theoretical relationships between accident numbers and traffic volumes and checked these

against data, while others have derived relationships more empirically. In order to deduce an empirical relationship, it is necessary either to study different roads carrying different volumes of traffic, or to examine time-series data. Research of the former type has often shown that the number of single-vehicle accidents per unit of vehicle distance travelled tends to decrease with increasing traffic, while the number of collisions between two or more vehicles tends to increase. Knowledge about relationships between accidents and traffic volumes at intersections is less extensive but includes useful results. Time-series studies have usually shown that accident numbers have grown more slowly in the long term than have volumes of traffic, but, because of the many other time-dependent factors which affect the incidence of accidents, care must be taken in drawing conclusions from such studies about the underlying relationship between accidents and traffic volumes. Comments are made concerning the data and methods likely to be useful in further research. (Copyright (c) Crown Copyright 1981.)

03024 Car Occupant Injury Patterns and Mechanisms (TRRL Supplementary Report No. 648)

Hobbs, C. A.
Transport and Road Research Lab., Crowthorne (England). c1981; 20p.

Order as: **PB82-139221**; PC A02/MF A01

Over a two year period, in-depth crash-injury investigations were performed on a comprehensive sample of accidents involving nearly two and a half thousand car occupants. The study covered a fixed geographical area being based on the catchment area of one large accident hospital. Included in the study were all car occupants, including those escaping injury, who were involved in any accident where one or more casualties attended the hospital. The sample was, therefore, as closely representative of the whole accident injury situation as was possible. This Report shows the relative frequencies of the different types of accident configuration and the associated risks of injury for the different seating positions and use or non-use of seat belts. The different patterns and mechanisms of injury are given for the basic impact types and because of the comprehensive nature of the sample it has been possible to put the severe but less frequent injuries into perspective with those more commonly occurring. For the more important causes of injury, in terms of clinical severity or frequency, distributions of injury severities are given along with details of the specific types of injury sustained. (Copyright (c) Crown Copyright 1981.)

03025 Lowering the Highest Legal Speed Limit from 110 to 90 km/h During Summer 1979 (Saenkning av Hoegsta Tillaten Hastighet fran 110 till 90 km/h Under Sommaren 1979) (Report No. VTI-190) *(in Swedish)*

Oberg, Gudrun; Carlsson, Gunnar
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 20p.

Order as: **PB82-123761**; PC A02/MF A01

Because of uncertainty in the oil market in the spring of 1979 and reduced access to oil and petroleum, the Swedish Government reduced the speed limit from 110 to 90 km/h during the period 6/21-10/15/1979. Investigations have shown that the average speed of passenger vehicles on motor highways declined from 107 to about 95 km/h during August but increased to about 100 km/h in Sept-Oct. On ordinary highways the average speed declined from about 97 to 90 km/h. On roads limited to 90 km/h, however, the average speed of passenger vehicles declined during the period from 89 km/h to 87 km/h. This reduction has meant a savings of 12 to 29 million liters of gasoline during the period. The 12 million figure applies to roads where the 110 limit formerly applied. The 29 million figure assumes that the lowered 110 limit has reduced speeds on 90 and 70 km limit roads. On an annual basis this would mean a saving of between 39 and 88 million liters, or 1-2 percent of the nation's gasoline consumption.

03026 Register of Accidents Reported to Police Occurring on National Highways (Olycksregister oever Polisrapporterade Trafikolyckor pa det Statliga Vaegnaetet) (Report No. VTI/Meddelande – 228) *(in Swedish)*

Engdahl, Goeran
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 38p.

Order as: **PB82-106626**; PC A03/MF A01

The report is a documentation of a traffic accident register available to the National Road and Traffic Research Institute. The register contains all traffic accidents occurring on the national highway system from 1972 to 1978 that were reported to the police. It also contains accident information from the highway data bank (VDB). The register was compiled in such a way that accident information from subsequent years may easily be added to the register as soon as that information is available from the highway data bank. An example is given of how the register is used at the National Road and Traffic Research Institute.

03027 A Basis for Traffic Accident Prognoses (Underlag foer Trafikolycksprognoser) (Report No. VTI/Meddelande – 216) *(in Swedish)*

Thulin, Hans
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 55p.

Order as: **PB82-106550**; PC A04/MF A01

The development of the traffic accident trend is described as based on official statistics and other sources of the past 20-year period, as well as the measures taken during that period and future plans. An accident prognosis model is discussed and applied to the results obtained. Single accidents have been increasing in number during 1970-1978 while the number of accidents between vehicles and unprotected individuals has gone down some. The number of accidents between motor vehicles seems to have remained constant or gone down some. The yearly number of traffic accidents involving animals that have been reported to the police increased during 1970-1978 by 3.5 times. The mandatory use of seat belts in the front seat has resulted in a reduction of the number of deaths and the accidents have become less

serious. No deaths have been reported for children using car seats (60% of children under 4). The prognosis is that the trend of the accident risk will continue in the same direction. New cars are being built with systems that indicate worn brake pads, incorrect tire pressure, incorrect loading, defective lights, or slippery road conditions.

03028 Samband Vintertid Mellan Vaederlek-Vaeglag-Trafikolyckor. Bestaemning av Vaederleksklasser (Wintertime Interrelationships Between Weather, Road Conditions and Road Accidents. Determination of Weather Classes) (Report No. VTI/Meddelande – 198) *(in Swedish; abstract and summary in Swedish and English)*

Bruede, Ulf; Larsson, Joergen
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 64p.

Order as: **PB81-172058**; PC A04/MF A01

The purpose of the project is to identify interrelationships between weather, road conditions and road accidents. Data have been assembled for the winter months of two years, 1973 and 1977. The number of accidents, number of injured persons, vehicle kilometers, etc., will be shown for different regions, types of roads (salted, non-salted roads), parts of the winter, weather and road conditions. The initial phase of work, which is reported in this Bulletin, involved studies which concentrated on defining suitable weather classes.

03029 Saenkning av Hoegsta Tillaten Hastighet Fran 110 till 90 km/h Under Sommaren 1979. Effekt pa Personskadeolyckor (Change of Maximum Speed Limit from 110 to 90 km/h During the Summer Period 1979 in Sweden. Effect on Personal Injury Accidents) (Report No. VTI/Meddelande – 197) *(in Swedish; abstract and summary in Swedish and English)*

Nilsson, Goeran
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 45p.

Order as: **PB81-168205**; PC A03/MF A01

In the beginning of June 1979 the Government, from reasons of saving energy, decided that the maximum speed limit from 1979-06-21 should be 90 km/h in Sweden. In this report the accident change from the period of 1978-06-21--10-15 to the period 1979-06-21--10-15 is reported with regard to different road types, motorways and half motorways, european roads, main national roads and other national roads, there the speed limit was changed from 110 to 90 km/h and there the speed limit was unchanged, 90 or 70 km/h. The conclusion is that the change of the speed limit 110 km/h to 90 km/h during the period 1979-06-21--10-15 has resulted in a reduction of the number of personal injury accidents, specially fatal accidents. The speeds have also decreased, 12 km/h on motorways and 7 km/h on two-lane roads. From the primary aim of saving energy it can also be concluded that the variations is speeds on 90-roads, where the speed limits have been unchanged, have decreased which to a great deal can explain the accident reduction on these roads.

03030 Kostnader/Normeringsfaktorer foer Polisrapporterade Trafikolyckor pa det Statliga Vaegnaetet med Haensyn Tagen till Olyckstyp och Trafikmiljoe (Costs/Correction Factors for Police-Reported Accidents on the State Road Network with Respect to Type of Accident and Traffic Environment) (Report No. VTI/Meddelande – 240) *(in Swedish; abstract and summary in Swedish and English)*

Bruede, Ulf; Larsson, Joergen
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 36p.

Order as: **PB81-168189**; PC A03/MF A01

In the latest priority assessment of road projects made by the Swedish Road Administration police-reported accidents were corrected with respect to type of accident and urban/rural area. Correction implies a differentation of accident costs in order to consider the severity of accidents and to compensate the variation in degree of accident reporting. The present study, sponsored by the Swedish Road Administration, investigates which of the factors type of accident, urban/rural area, speed limit, county and paved width that is most important to take into consideration in correction of police-reported road accidents. In this investigation accident data from the years 1975-78 was used (about 100,000 accidents). According to the results accident cost primarily vary with type of accident and speed limit but also the variations by county are considerable enough to be taken into consideration in the correction of accidents.

03031 Olyckstyper med Oevningsbilar vid Trafikskola. En Enkaetundersoekning (Types of Traffic Accidents with Driving Students) (Report No. VTI – 198) *(in Swedish; abstract in Swedish and English).*

Spolander, Krister
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 24p.

Order as: **PB81-168171**; PC A02/MF A01

In 56 per cent of all their accidents with a student at the steering wheel, driving school cars have been hit from behind. These accidents are of two kinds mainly, according to a study in which 1268 random sampled driving teachers answered a questionnaire by mail after a 4.7 per cent rate of nonresponse. In half of the cases the student had been braking or got an inadvertent engine stop. In the other half the student had been waiting in an intersection, in a traffic line, or similar situations. Accidents in which drivers behind the student's car have been surprised by sudden stops, occur earlier in the driver training than other types of rear end collisions or other accidents. In 3 per cent of all accidents persons have been injured to an extent that medical diagnosis or treatment have been necessary.

03032 Samband Mellan Floede, Koncentration och Olyckor pa Straeckor – en Teoretisk Diskussion (On Relations Between Flow, Concentration and Accidents on Road Stretches. A Theoretical Study) (Report No. VTI/Meddelande – 175) *(in Swedish. Abstract in Swedish and English).*

Svensson, Ake
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1979; 33p.

Order as: **PB81-129728**; PC A03/MF A01

The number of accidents on a road stretch is highly dependent on the volume of traffic. The amount of dangerous traffic situations (e.g. meetings and overtakings) and the distribution between free vehicles and vehicles in queues change as the flow and concentration of the traffic change. Two analytic models of traffic, one isoveloxic and one equilibrium model, are used to study these relations. Using simple models that connects traffic situation with accident types, the expected numbers of meeting and overtaking accidents and single accidents are calculated.

03033 Undersoekning av Nagra Statistiska Modeller foer Analys av Trafikolycksdata (On Some Statistical Models for Analysing Road Traffic Accident Data) (Report No. VTI – 187) *(in Swedish. Abstract and Summary in English).*

Svensson, Ake
National Swedish Road and Traffic Research Inst., Linkoeping. 1979; 64p.

Order as: **PB81-128282**; PC A04/MF A01

In order to analyse the effects of different measures on the number of road traffic accidents realistic statistical models are required. Two road safety problems are studied. The fit between some statistical models and empirical data is tested. The first problem concerns the effect of speed limits and the second problem the connection between traffic flow and accident types.

03034 Some Effects on Accidents of Changes in Light Conditions at the Beginning and End of British Summer Time (TRRL Supplementary Report No. 587)

Green, Hilary
Transport and Road Research Lab., Crowthorne (England). c1980; 15p.

Order as: **PB81-127375**; PC A02/MF A01

The effect on accidents of the changes in light conditions in some hours at the beginning and end of British Summer Time has been studied. Darkness is assumed to be the period between the beginning and end of lighting-up time. On the day BST ends, a period of one hour in the morning that was dark acquires a mixture of daylight and twilight and vice versa in the evening, the process being reversed in the spring. At least 5 weekdays before and after the change are required to yield sufficient accident data. For reasons explained in the Report, the appropriate morning periods still provide too little accident data, and so have not been studied. Great Britain was divided into 6 regions to make some allowance for regional variations in light-up times, and accident totals were collected for each region for the relevant hour in the evening. Accidents for the remainder of the day were used as 'controls'. Some of the ameliorating effects of street lighting were avoided by only using accidents on roads with speed limits over 40 mile/h. The results were consistent over the country, and were in line with earlier findings. They indicated that the immediate effect of the clock change, outside built-up areas in the busy evening hours studied, was that in darkness the frequency of all injury accidents was about 50 per cent higher, and that of fatal and serious accidents was about 100 per cent higher, than in a mixture of daylight and twilight. (Copyright (c) Crown Copyright 1980.)

03035 Haveriundersoekningar – en Litteraturstudie och en Redovisning av Haveriundersoekningar av Vaegtrafikolyckor i de Nordiska Laenderna (Multidisciplinary Accident Investigations – a Literature Survey and an Account of Multidisciplinary Investigations of Road Traffic Accidents in the Nordic Countries) (Report No. VTI – 170) *(in Swedish. Abstract in English)*

Englund, Anders
National Swedish Road and Traffic Research Inst., Linkoeping. 1978; 175p.

Order as: **PB81-126823**; PC A08/MF A01

In the Nordic Road Safety Council's project Methods for the Collection and Presentation of Accident Data (MIRO) a literature survey has been performed concerning multidisciplinary investigations of road accidents. This study has been one of three sub-projects in the first phase of the MIRO-project. After an introductory, short historical outline various aspects are presented concerning the design and performance of projects with multidisciplinary accident investigations. This regards background, objectives and different factors which have influenced project design - e.g. methodological questions - and the extent to which this is described and discussed in reports in this area. Further aspects dealt with in the study are the composition of the investigation group, methodology for alarm, mobilization and work on the accident scene, collection of data, data processing and analysis, presentation and utilization of results. Costs and administrative problems in connection with multidisciplinary accident investigations concludes this part.

03036 Tabulations of 1977 Road Casualties Indicating Risks of Injury to Road Users in Relation to Vehicles Involved (TRRL Supplementary Report No. 576)

Williams, Marian C.
Transport and Road Research Lab., Crowthorne (England). c1980; 24p.

Order as: **PB81-102907**; PC A02/MF A01

Tables are produced showing classes of road users involved in injury accidents in 1977 (with the emphasis on fatal and serious accidents) and the vehicles with which they were involved. Accident numbers are broken down into one vehicle and pedestrian, one vehicle only, two vehicles, and three or four vehicle accidents, and are tabulated to show the numbers of accidents involving various combinations of vehicle type. The relative risk of injury to the drivers of the different vehicles in a two-vehicle accident is also indicated. Pedestrians are shown separately in the tables. Some discussion of these tables is included and a comparison with similar figures for 1971 is given. The tables given indicate the accident configurations which contribute the major proportions of casualties occurring in Great Britain, and show that the main contributors are pedestrians in conflict with cars, and

two-wheelers and cars involved in either single-vehicle accidents or with each other. The importance of relative vehicle mass in determining injury risk is illustrated in some tables. The tables are also intended to provide researchers with more detail than is availble elsewhere about the involvement in accidents of various classes of road use. (Copyright (c) Crown Copyright 1980.)

03037 Permanent Disability in Road Traffic Accident Casualties (Report No. TRRL – LR – 924)

Grattan, E.; Hobbs, J. A.
Transport and Road Research Lab., Crowthorne (England). c1980; 15p.

Order as: **PB81-102733**; PC A02/MF A01

The incidence, severity and anatomical distribution of permanent disability were studied in a sample of road traffic accident (RTA) casualties all of whom were detained in the hospital for more than 10 nights. There were 265 such cases out of a total of 3541 living RTA casualties brought to one hospital over a two year period in 1974/76; one hundred and four were vehicle occupants, 61 pedestrians, 81 motorcyclists and 19 bicyclists. Of these 83 suffered permanent disability. Five categories of disability severity were delineated: nil, slight, moderate, severe and very severe. No severe or very severe disability was seen in bicyclists. Severe and very severe disability together appeared to be most frequent amongst motorcyclists. If all severities are taken together the head and lower limbs were the regions of the body most commonly incurring disability. Severe disability occurred most frequently to the head, to the upper limbs and lower limbs and very severe disability only to the brain and spinal cord. It can be assumed that severe or very severe disability is unlikely to have been incurred in out-patients or in those detained for 10 nights or less, the incidence of severe and very severe disability in this sample as a whole (3541 casualties) would be of the order of 0.4 percent and 0.2 percent respectively. The degree of correlation between permanent disability and a number of factors related to it is discussed. (Copyright (c) Crown Copyright 1980.)

03038 Incidence of Multiple Fatality Accidents in the U.K.

Griffiths, R. F.; Fryer, L. S.
UKAEA Safety and Reliability Directorate, Culcheth (England). Mar. 78; 9p.

Order as: **SRD-R-110**; PC A02/MF A01 U.S. Sales Only.

The report presents a compilation of available data showing the frequency of occurrence of accidents resulting in multiple fatalities in the United Kingdom (or Great Britain, as the data permits). Frequency vs. number-of-fatalities graphs are plotted for the following five classes of fatalities:- persons killed in fires in the UK; crew members of UK registered ships; railway passengers in Great Britain; passengers of aircraft on the British register; occupants of Public Service Vehicles in Great Britain. The information needed to compile a more comprehensive set of graphs was found to be unobtainable. The report concludes with the suggestion that procedures for reporting and recording details of fatal accidents should be reviewed. (Atomindex citation 09:417913)

03039 Further Research on Road Accident Rates in Developing Countries (Second Report) (TRRL Supplementary Report No. 434)

Jacobs, G. D.; Hards, Wendy A.
Transport and Road Research Lab., Crowthorne (England). c1978; 17p.

Order as: **PB80-151723**; PC A02/MF A01

In developing countries in 1974, the authors estimate that there were over 100,000 people killed and 1,500,000 injured in road accidents. However the situation in developing countries, unlike that in Western Europe and North America, appears to be worsening. Until 1972, very little research had been carried out on the problem of road accidents in developing countries but in 1972, following requests for aid and guidance in this field, a small team was formed within the TRRL Overseas Unit. Over the last five years much of the emphasis of the work of this team has been directed towards the collection and analysis of road accident data so that the nature of the problem could be identified. Much of this work has already been published, and in 1975 a paper on this subject was presented at the Summer Annual Meeting of the PTRC. Since publication of the above reports and papers, further research has been carried out on road accident rates and trends in developing countries which illustrates the growing seriousness of the problem. This work is described in the report.

03040 A Study of Road Accidents in Selected Urban Areas in Developing Countries (Laboratory rept. TRRL – LR – 775)

Jacobs, G. D.; Sayer, I. A.
Transport and Road Research Lab., Crowthorne (England). 1977; 26p.

Order as: **PB280 212/2SL**; PC A03/MF A01

This report presents an analysis of personal injury accident rates for roads in selected urban areas in developing countries. It shows, for a number of cities, the distribution of accidents by type of road, class of road-user and vehicle involved. It was found that in the cities studied, the accident and casualty rates (per licensed vehicle) were about 60 per cent greater than in urban areas in Great Britain. The fatality rates were found to be at least eight times greater than in Great Britain and up to thirty times greater than in the United States. Relationships between accident rates and vehicle and pedestrian flows were derived and compared with similar relationships derived in Great Britain. (Copyright (c) Crown Copyright 1977.)

03041 Road Accidents as a Cause of Death in Developing Countries (TRRL Supplementary Report No. 277)

Jacobs, G. D.; Bardsley, Marguerite N.
Transport and Road Research Lab., Crowthorne (England). 1977; 23p.

Order as: **PB-276 668/ISL**; PC A02/MF A01

Using published data, a comparison was made in fifteen developing countries of the number of deaths from road accidents and the deaths

from specific diseases normally associated with the Third World. It was found that road accidents accounted for almost 17 per cent of the total number of deaths studied, a value exceeded only by deaths from enteritis (and other diarrheal diseases). The trends in the number of deaths per head of population in four countries over the period 1960-72 were calculated. It was found that while the rates for infectious, intestinal and respiratory diseases decreased, the death rate for road accidents increased over this period. An analysis of the medical records of the three major hospitals in Nairobi showed that there were more in-patients receiving treatment for road accidents in 1974 than for all but one of the groups of diseases thought to be of concern in developing countries. In two of the hospitals studied, the treatment of road accident cases accounted for over 13,000 in-patient days, over 5 per cent of the total available. (Copyright (c) Crown Copyright 1977.)

03042 Further Research on Road Accident Rates in Developing Countries (TRRL Supplementary Report No. 270)

Jacobs, G. D.; Fouracre, P. R.
Transport and Road Research Lab., Crowthorne (England). 1977; 29p.

Order as: **PB-276 522/OSL**; PC A03/MF A01

Using published data, a study was made of changes in road accident rates over the ten year period 1961-71 in a number of developing countries. It was found that in the majority of countries there was a continuing downward trend in fatality and injury rates per licensed vehicle. Kenya, Jamaica, Zambia, Malawi and Nigeria are notable exceptions and detailed road accident data were used to try to determine underlying factors associated with the increases in fatality and injury rates per licensed vehicle in these countries. In 28 developing countries for which data were available in 1968 and 1971, fatalities per licensed vehicle were found to be related to vehicle ownership levels, the higher the vehicle ownership level, the lower the fatality rate.

03043 The Effects on Road Accident Rates of the Fuel Shortage of November 1973 and Consequent Legislation (TRRL Supplementary Report No. 236)

Scott, P. P.; Barton, A. J.
Transport and Road Research Lab., Crowthorne (England). 1976; 38p.

Order as: **PB-276 190/6SL**; PC A03/MF A01

Analysis has been made of the changes in road accident rates up to July 1975 following fuel conservation measures imposed by the UK Government since November 1973. Predictions have been made, based on trends and variations observed in past accident rates, of the rates that would have occurred in the absence of the fuel shortage. Comparison of the observed rates with these predictions measures the extent of any changes that have occurred. There were statistically significant reductions in accident rates on motorways and all-purpose roads normally with speed limits of 50 mile/h or higher during the period December 1973-Spring 1974, while these roads were subject to 50 mile/h speed limits. There was no similar reduction on roads subject throughout to lower speed limits. After the limits were returned to 'normal', in Spring 1974, there was still a reduction in accident rates on 'high-speed' roads, but of a much smaller magnitude than during the speed limit period. The re-introduction of lower limits in December 1974 does not appear to have been associated with as large an effect on accident rates as the limits of the previous winter. The reduction in accident rate from that predicted on the roads subject to the new limits was statistically significant for the first three months. After February 1975 the accident rates were not significantly different from those expected. It has not been possible to make an entirely satisfactory analysis of the effects of the street-lighting cuts in Winter 1973-74, since the roads on which the lighting condition changed cannot be isolated for separate study. Analysis of accident rates on all urban roads in darkness does not demonstrate overall an adverse effect of the cuts, though variations in effect between different types and locations of accident may be masked. (Copyright (c) Crown Copyright 1976).

SEE ALSO: 03011; 03013; 03046; 03050; 03054; 03055; 03072; 03087; 03089; 03091; 03093; 03094; 03099; 03128

ACCIDENT TYPES

03044 Trafikolyckors Samband med Linjefoering-foer Olika Belagd Bredd, Hastighetsgraens, Arstid, Ljusfoerhallanden och Region (Influence of Road Alignment on Traffic Accidents – for Different Paved Widths, Speed Limits, Seasons, Light Conditions and Regions) (Report No. VTI/Meddelande – 235) *(in Swedish; abstract and summary in Swedish and English)*

Bruede, Ulf; Larsson, Joergen; Thulin, Hans
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 99p.

Order as: **PB81-168197**; PC A05/MF A01

The Swedish Road and Traffic Research Institute has previously developed a so-called prediction model for road traffic accidents referring to road links of ordinary two-lane roads. The model considers vehicle mileage, speed limit, class of alignment, and paved width. The purpose of the present study is to differentiate the model still further, primarily with regard to alignment. In addition an aim is to have the model consider season, light conditions, region and type of accident. The investigation refers to about 875 km of two-lane roads on the main road network in which some 14,000 single- or multi-vehicle accidents occurred during the period 1972-76.

03045 Vaegkorsningar inom Huvudvaegnaetet med Hastighetsbegraensning 50 km/h. En Olycksstudie (Main Road Junctions with a Speed Limit of 50 km/h. An Accident Study) (Report No. VTI/Meddelande – 233) *(in Swedish; abstract in Swedish and English)*

Bruede, Ulf; Larsson, Joergen
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 53p.

Order as: **PB81-168163**; PC A04/MF A01

The study deals with level junctions in the main road network with a 50 km/h speed limit

on every state road connection. The accident data refers to police-reported accidents during the years 1972-75. The study deals with where the junctions are situated (urban or rural area), traffic volume, traffic composition and junction design. The study also includes an investigation of how accident rate (number of accidents per entering vehicle) and injury consequence (number of injuries per accident) vary and how the accidents are distributed on type of conflict. Attempts were made to estimate how the risk of a vehicle being involved in an accident varies between the different traffic streams. Comparisons were also made between accident rate in junctions with a 50 km/h speed limit (mainly urban areas) and in junctions with a speed limit > or equal 70 km/h on every state road connection (mainly rural areas).

03046 Cross-Over Accidents on All-Purpose Dual Carriageways (TRRL Supplementary Report No. 617)

Johnson, H. D.
Transport and Road Research Lab., Crowthorne (England). c1980; 15p.

Order as: **PB81-160467**; PC A02/MF A01

Accident data for some, mainly rural dual carriageway roads have been examined in order to assess the possible effect on the frequency of casualties and of damage-only accidents of central safety fences installed as a general policy on such roads. It is estimated that the erection of a safety fence would result in a reduction in fatal casualties, little change in serious and slight casualties and an increase in non-injury accidents. (Copyright (c) Crown Copyright 1980.)

03047 Untersuchungen ueber Unfallraten in Abhaengigkeit von Strassen-und Verkehrsbedingungen ausserhalb geschlossener Ortschaften. Untersuchung der Unfaelle mit Personenschaeden auf Autobahnen (Investigation of the Effects of Highway and Traffic Conditions Outside Built-Up Areas on Accident Rates) (Issue No. 223) *(in German)*

Krebs, Hans Guenter; Kloeckner, Juergen Heinz; Bruehning, Ekkehard
Bundesministerium fuer Verkehr, Bonn-Bad Godesberg (Germany, F.R.) Abt. Strassenbau. 1977; 154p.

Order as: **PB81-154684**; PC A08/MF A01

The attempt was made to investigate the influence of pavement width, horizontal curve radius, gradient, sight distance, curvature and traffic volume on accidents. The principal aim was to define the accident rate and accident cost rate. Factorial variations of types of accidents, day/night and dry/wet, were carried out for each parameter. In addition to nonlinear regression equations, multiple regression equations were utilized in order to take the simultaneous effects of interrelated functions of several parameters into consideration. Accident data and design parameters compiled from about 1150 km of two-lane rural highways in the Fed. Rep. of Germany were evaluated and analyzed. It was possible to confirm and quantify the fundamental relationships between highway and design parameters and accidents, already known from several papers on this subject, for two-lane highways in the Fed. Rep. of Germany. In addition, a wealth of new relevant details was obtained.

03048 Variation in Vehicle Conflicts at a T-Junction and Comparison with Recorded Collisions (Paper presented at the International Traffic Conflicts Technique Workshop (2nd), Paris, May 10, 11, 12, 1979.) (TRRL Supplementary Report No. 545)

Spicer, B. R.; Wheeler, A. H.; Older, S. J.
Transport and Road Research Lab., Crowthorne (England). c1980; 34p.

Order as: **PB81-100570**; PC A03/MF A01

A study has been made of the numbers of vehicle conflicts occurring over a period of six months at a T-junction where two main roads meet. Daily and hour of day conflict count numbers were obtained for week-days during the period of study. There was no evidence of either a day or week or a seasonal effect on these counts. However, although there was no regular pattern, definite day to day variation did exist. A marked pattern of variation in conflict numbers with hour of day was found. In both cases relations were demonstrated between conflict numbers and vehicle flow. The closest relation appeared to be that by hour of day. It was found that prediction, usually within about 10 percent of the true value of the long term daily average of conflict numbers could be made from two or three days' counts at this site. Collision data, recorded by time lapse cine film over the full 6 months of study, were not sufficient to make a meaningful comparison with recorded conflicts. (Copyright (c) Crown Copyright 1980.)

03049 Injuries to Occupants of Heavy Goods Vehicles (Report No. TRRL – LR – 854)

Grattan, E.; Hobbs, J. A.
Transport and Road Research Lab., Crowthorne (England). c1978; 14p.

Order as: **PB-301 127/7SL**; PC A02/MF A01

Little research has been undertaken into the injuries received by occupants of heavy goods vehicles (HGVs). Nationally in 1975 HGV occupant casualties represented only 2 per cent of all vehicle occupant casualties. Of these only a quarter (800 casualties) sustained fatal or serious injury. Thus the numbers of casualties in HGVs are relatively small, but when they do occur they are usually the result of impact between two HGVs or between HGV and a roadside obstacle. This paper describes the findings of an in-depth investigation into the pattern and causes of injury in a sample of 59 seriously or fatally injured occupants of heavy goods vehicles. All fatal injuries were associated either with massive intrusion of the cab structure or with ejection of the occupants. This pattern of death is different from that found amongst unbelted passenger car occupants. A comparison is made between the patterns, causes and mechanisms of injury, more severe than minor, sustained by HGV occupants and by car occupants. Differences were found in the injury patterns and for causes of injury,

particularly in respect of injury to the head, pelvis and lower leg. The data suggest that the wearing of seat belts by the occupants of HGVs might have reduced the severity of injury for about one-third to one-half of the casualties in this small sample. (Copyright (c) Crown Copyright 1978.)

03050 Accidents on Urban Arterial Roads (Report No. TRRL – LR – 838)

Chapman, R. G.
Transport and Road Research Lab., Crowthorne (England). c1978; 23p.

Order as: **PB-299 470/5SL**; PC A02/MF A01

A detailed investigation has been made of road and environment features affecting accident rates on the main traffic routes in four towns in Southern England. Details of over 1000 personal injury accidents were examined and the main types of accidents identified. Accident rates along sections of road passing through different types of land use were compared and the rate was found to be highest on roads passing through suburban shopping areas. Accidents were also found to cluster at a few very busy junctions. Some methods of reducing accidents were discussed and it was concluded that a substantial reduction in overall accident numbers on arterial roads could be achieved by introducing road safety measures to a comparatively small part of the road network. (Copyright (c) Crown Copyright 1978.)

03051 Road Accidents in Traditionally Designed Local Authority Estates (Prepared by Institution of Highway Engineers, London (England)) (TRRL Supplementary Report No. 394)

Bennett, G. T.; Marland, Jean
Transport and Road Research Lab., Crowthorne (England). c1978; 44p.

Order as: **PB-297 325/3SL**; PC A03/MF A01

Accident records for about 9000 streets in local authority residential estates, free from substantial through traffic, in 20 towns, were analyzed in relation to population statistics, traffic flow, observations of children and parked vehicles, design parameters etc., using multiple regression and other techniques. The emphasis was on pedestrian accidents, which were predominantly to children. The object was to contribute towards the solution of the problem of the safe design of residential areas.

03052 Traffic Conflict Surveys: Some Study Design Considerations (Prepared in cooperation with Toronto Univ. (Ontario). Dept. of Civil Engineering.) (TRRL Supplementary Report No. 352)

Hauer, E.
Transport and Road Research Lab., Crowthorne (England). **Toronto Univ. (Ontario). Dept. of Civil Engineering. c1978; 35p.

Order as: **PB-284 511/3SL**; PC A03/MF A01

The traffic conflicts technique is a device for indirect safety measurement. It requires at present the conduct of a field survey to count conflict occurrence. On this basis the rate at which conflicts occur is estimated. This report deals with the accuracy of such estimation and its dependence on the design of the field survey. First, present practice in conflict count duration is reviewed. Next, the relationship between count duration and estimation accuracy is examined. Using data obtained from several sources the daily variability of conflict counts is described. It is concluded that the expectd conflict rate varies from day to day. Use of the negative binomial distribution is suggested as appropriate for the representation of the distribution of sample means obtained from conflict studies. On this basis, confidence limits and probabilities of Type I and Type II errors in hypothesis testing are obtained and tabulated. Their use in study design is illustrated by numerical examples. (Copyright (c) Crown Copyright 1977.)

03053 Methodology of an In-depth Accident Investigation Survey (Laboratory rept. TRRL–LR–762)

Staughton, G. C.; Storie, Valerie J.
Transport and Road Research Lab., Crowthorne (England). 1977; 37p.

Order as: **PB-280 875/6SL**; PC A03/MF A01

The circumstances leading up to the occurrence of road accidents are so complex that a reliable assessment of accident causation can only be made with detailed knowledge of the many aspects of road environment, vehicle and road user which may have contributed to the accidents. This report describes in detail the techniques adopted for an On-the-Spot investigation into accident causation starting with attendance at the scene and ending with a full assessment of the contributing factors. The organization, staffing, investigating and analytical procedures used are described; difficulties encountered and possible improvements in technique are also discussed. (Copyright (c) Crown Copyright 1977.)

03054 Accident Investigation and Prevention by Applying the Location Sampling Technique to Rural Crossroads (Laboratory rept. TRRL – LR – 780)

Faulkner, C. R.; Eaton, J. E.
Transport and Road Research Lab., Crowthorne (England). 1977; 18p.

Order as: **PB-280 515/8SL**; PC A02/MF A01

Accident investigation by location sampling, in which accident reports from groups of similar road sites were pooled to identify common hazards, showed that at many crossroads, over-running of the major carriageway from the minor road was an accident hazard at levels of traffic flow below that which would warrant full scale improvement work. The subject of this Report is the effective development, from the basis of the location sampling study, of a low-cost improvement for straight-through rural crossroads. For the experiment a sample of thirteen crossroads was selected on Class A and B roads in as many Counties of England and Scotland. The experiment consisted of installing traffic islands in the minor road approaches, extending minimally to the left of the center lines so as to discourage driving straight through the intersections, and to alert drivers, causing them to take appropriate action. Analysis of accidents reported over periods of four years before

and four years after installation of the islands showed a significant reduction of 49 per cent of the total of accidents which would have been expected after allowing for external changes.

03055 Accidents at Off-Side Priority Roundabouts with Mini or Small Islands (Laboratory rept. TRRL – LR – 774)

Green, Hilary
Transport and Road Research Lab., Crowthorne (England). 1977; 33p.

Order as: **PB-280 211/4SL**; PC A03/MF A01

Injury accidents were studied at 150 junctions and roundabouts before and after the installation of single or multiple islands, curbed or uncurbed. 132 of these, considered separately, were previously governed by 30 or 40 mile/h speed limits with (A) priority control, (B) traffic signals, or (C) roundabouts. Type (A) 88 sites, had statistically significant reductions of 34 and 46 per cent in all injury and in fatal plus serious injury accidents respectively whether uncurbed sites were included or not. Type (B) 13 sites, all types combined, showed a statistically significant decrease in fatal plus serious accidents of 62 per cent. Type (C) 31 sites, all types curbed--all types except single curbed island sites with 3 arms showed a statistically significant increase of 91 per cent for all accidents and rather more for fatal plus serious especially when 2 multiple systems were included (200 per cent). Accidents involving two-wheeled motor vehicles at type A sites, and those involving pedal cycles at type C sites, expressed as proportions of the total, were significantly reduced. In higher speed limit zones the changes in all accidents at a few sites, type (A)-10 sites and (C)-8 sites, were statistically significant and gave indications endorsing the results above. (Copyright (c) Crown Copyright 1977.)

03056 Avkoerningsolyckor och Vaegens Sidoutrymme. Etapp 2. Olycksrisk samt Samband Mellan Skadefoeljd och Utformningen av Vaegens Sidoutrymme (Run-off-the-road Accidents and the Roadside Area. Phase 2) (Report No. VTI – 127) *(in Swedish. Abstract and Summary in Swedish and English)*

Pettersson, Roland
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1977; 52p.

Order as: **PB81-129769**; PC A04/MF A01

The object of this project is to find appropriate measures relating to the road, the traffic (e.g. traffic regulations) and the side clearance of the road, in order to reduce the number of run-off-road accidents and also to lessen the injury caused by these accidents. Different types of measures may be considered in order to achieve this. The number of run-off-road accidents can be reduced by e.g. improved road across section, alignment, lower speed limit or by the introduction of stationary road lighting. The consequential injury due to these accidents can be lessened by suitable design of the road side section with regard to width, presence of solid objects, evenness, gradient, treatment of solid objects so as to give them a soft surface texture, erection of road barriers, and imposition of a lower speed limit.

03057 Avkoerningsolyckor och Vaegens Sidoutrymme. Etapp 3. Olyckskotnader Samt Beraekning av Olyckrisker och Olyckskostnader foer Objekt i Sidoutrymmet (Run-off-the-road Accidents and the Roadside Area. Phase 3. Accident Costs and Estimates of Accident Risks and Costs for Objects in the Roadside Area) (Report No. VTI – 185) *(in Swedish. Abstract and Summary in Swedish and English)*

Schandersson, Rein
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1979; 146p.

Order as: **PB81-129777**; PC A07/MF A01

The goal of the project is to find appropriate measures related to the road, the traffic and the road-side area, in order to reduce the number of run-off-the-road accidents and to reduce the severity of these accidents. The purpose of the third stage was to estimate the costs for run-off-the road accidents; investigate how the costs for run-off-the-road accidents vary with type of object struck, road-side design, etc.; and modify an existing model, with which the reduction in accidents costs can be estimated for improvements concerning objects in the road side area.

03058 Trafiksaekerheten pa Stoerre Trafikleder i Taetort (Traffic Safety at Traffic Junctions in Heavily Populated Areas) (Report No. VTI/Meddelande – 172) *(in Swedish. Summary in English)*

Cedersund, Hans-Ake
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1979; 54p

Order as: **PB81-130775**; PC A04/MF A01

The investigation comprises police-reported accidents in 1975 and 1976. Data on accident frequency, distribution on accident type, number of injured and accidents consequence has been provided for each junction and road stretches between junctions. Traffic flow data have been obtained from local authority counts. As measures of traffic safety accident rate, number of accidents per million kilometers of pair of axles, and injury rate, number of injured and killed per million kilometers of pair of axles, have been used. The report also presents a method for the calculation of accident rate on short stretches in urban areas.

HAZARDS & ACCIDENT PREVENTION

HAZARD PHENOMENA

03059 Some Aspects of Motorway Traffic Behaviour in Fog (Report No. TRRL – LR – 958)

White, M. E.; Jeffery, D. J.
Transport and Road Research Lab., Crowthorne (England). c1980; 28p.

Order as: **PB81-160376**; PC A03/MF A01

This report describes an experiment to determine the effect of fog on the speed and

spacing of traffic on the M4 motorway. A discussion of visual range in day and night-time fogs is included to show that these two conditions should be considered separately. In the range of day-light fogs tested (visibility down to 150m) the relations between mean traffic speed and visibility are well defined and remain substantially unaffected until the driver's visibility distance, as given by a measure of the meteorological visual range, falls below about 200m. In a similar range of night-time fogs mean traffic speeds are more variable, but the trend is similar to day-time if the driver's visibility distance is taken as the maximum distance at which a vehicle rear light of about 2 candela intensity can be seen through a dipped headlamp beam. In conditions where the visibility distance does not fall below about 150m, average traffic speeds are generally sufficiently low to enable most drivers to stop within their visibility distance, but the reduction in speed with reducing visibility is accompanied by an increase in close following causing an overall increase in risk. Around one-third of all vehicles follow within a 2 second inter-vehicle time gap when driver visibility distances are reduced to 150m in day or night-time fog conditions. (Copyright (c) Crown Copyright 1980.)

03060 Vaeghalkans Beroende av Mikrooch Lokalklimatiska Faktorer (The Influence of Micro- and Mesoclimatological Factors on Ice-Formation on Roads) (Report No. GUNI – 8) *(in Swedish)*

Lindqvist, Sven
Goeteborg Univ. (Sweden). 1975; 43p.
Order as: **PB81-128308**; PC A03/MF A01

The project involves a general study of the connection between meso- and microclimates and ice-formation on roads, methods to find suitable sites for ice-warning devices, and a discussion of micro-meteorological aspects on the construction of such devices. Measuring trips by car is an appropriate method of collecting data for local climate investigations; the results from a large number of measuring points becoming available within a limited period of time. As regards more large-scale mean value calculations, stationary instruments are to be preferred to measuring trips. Information on surface temperatures can be given by apparatus for registering heat radiation, e.g. airborn equipment for infrared thermography and infrared cameras. After a preliminary investigation experimental ice-warning devices were located on selected sites. Each site was instrumented to record atmospheric temperature and humidity at two levels, wind speed, road surface wetness and temperature below road surface. Data were sent by radio to a central unit. Finally some experiments have been made in testing a carbon ice-warning device and in mapping radiation fog close to the road.

03061 Studier av Halka Pa Vaeger (Studies of Slipperiness on Roads) (Report No. GUNI – 12) *(in Swedish)*

Lindqvist, Sven
Goeteborg Univ. (Sweden). 1979; 48p.
Order as: **PB81-128316**; PC A03/MF A01

The main project involves micro and mesoclimatological investigations on roads for detection of road sections with high frequency of slipperiness. The results are partly to be of direct assistance to maintenance authorities, partly to give information on siting ice-warning devices. When performing measuring trips for road climatological investigations the cars used have been equipped with instruments for registration of air temperature on two levels and air humidity. The possibility of using thermal infrared scanning for detection of road surface temperature has also been discussed. In connection with meteorological situations an unprejudiced analysis of different kinds of slipperiness on roads was made. The investigation includes a discussion of factors involved in different ice formation processes and parameters possible to record. Twenty-four different situations with coating of ice, rime, snow, slush and sleet were found. Finally some ideas are given of what parameters should be recorded in slipperiness warning systems.

03062 Metoder foer Bestaemning av Halkfrekventa Vaegstraeckor (Methods for Detecting Road Sections with High Frequency of Ice Formation) (Report No. GUNI – 10) *(in Swedish)*

Lindqvist, Sven
Goeteborg Univ. (Sweden). 1976; 34p.
Order as: **PB81-128290**; PC A03/MF A01

The author has earlier discussed the influence of micro and mesoclimatological factors on ice formation on roads. During the winter season 1975-76 two new investigations in this project were carried out. The aim of both these investigations was to work out appropriate methods for detecting sections with high frequency of ice formation. One of the investigations was carried out as a conventional local climatological study of air temperature and air humidity close to the road surface. Measuring trips by car and stationary instruments were used for data collection. The investigated roads have a length of 180 kilometers. To make a visual combination of results possible, a simple local climatological map has been constructed. The frequency of slipperiness on roads has been marked on the maps in three classes and for each marking the micrometeorological situation for ice formation is stated. These maps are of value for road maintenance and have already been used when placing stations which give information to road offices concerning air temperature, air humidity and road surface temperature. The other investigation concentrated on surveying road surface temperatures by means of airborne infrared thermography. Thermography can be a useful tool in the future when detecting road sections with high frequency of ice formation.

03063 Driving in Fog on the M4 (TRRL Supplementary Report No. 281)

Sumner, R.; Baguley, C.; Burton, J.
Transport and Road Research Lab., Crowthorne (England). 1977; 26p.
Order as: **PB-276 758/0SL**; PC A03/MF A01

One thousand seven hundred and eighty vehicles were photographed from the rear while being driven in fog on the M4. Speed, vehicle registration number, date and time were recorded on the photograph while separate equipment monitored the visibility level. The registered keepers of 600 of these vehicles were traced and sent a questionnaire asking for the drivers' opinions on the conditions in which the vehicle was photographed and on driving in fog generally. Seventy six per cent of questionnaires were returned. At a visibility of 50 m or less more than half the drivers were exceeding the speed at which they could stop within this visibility distance. (Copyright (c) Crown Copyright 1977.)

SEE ALSO: 03114; 03119; 03120

RISK ASSESSMENT

03064 Road Traffic and Risk Experience of the Individual Driver (Vegtrafikk og Risikoopplevelse hos Individet) *(in Norwegian)*

Pedersen, Trond O.
Transportoekonomisk Inst., Oslo (Norway). Jun. 80; 29p.
Order as: **PB82-156159**; PC A03/MF A01

The report presents the road traffic as a system with built-in accident risks. Different theories, models and data concerning individuals traffic behavior and perception of traffic hazards are presented and discussed. The survey is based on published literature in the field.

03065 Accident Risk by County (Report No. RS-256)

Crowley, F.
Foras Forbartha Teoranta, Dublin (Ireland). Sep. 80; 49p.
Order as: **PB82-120494**; PC A03/MF A01

The object of the report is to examine differences between counties in respect of accident risk. The three direct measures of accident risk used are injury accident rate per registered vehicle, per head of population and per vehicle mile of travel. The advantages and disadvantages of each of these measures are discussed in the Introduction, and the sources of the data used in the report are described. In the second chapter of the report counties are ranked on each of the measures and the rankings are compared. In the third chapter trends in accident risk by county over the decade 1968 - 1978 are examined. The fourth chapter deals with accident risk on the National Routes by county, using accident rate per vehicle mile as a direct measure of risk, and the number of identified 'black spots' as an indirect measure. In the fifth chapter, the risk of accident on wet roads by county is discussed in detail, and the incidence of wet road skidding accidents on the National Routes is examined in relation to measured skid resistance.

03066 Risk Exposures. Structuring of the Need for Risk Exposure Data for Traffic Accidents Analysis (Translation) (Report No. VTI-144-A)

Nilsson, Goeran
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1978; 41p.
Order as: **PB81-128456**; PC A03/MF A01

In the continuous research and development work, carried out at the National Swedish Road and Traffic Research Institute, different measurements for road accidents are tested in order to find measurements to be used in different decision procedures, intended to result in measures. The first requirement is that the accident measurements shall allow relevant comparisons between different groups of road-users and/or different road and traffic conditions. When developing accident measurements it is essential to define and to deduce traffic measurements, that show strong correlations with the number of accidents. These traffic measurements are called risk exposures.

03067 The Known Risks We Run: The Highway (Paper presented to the Symposium: 'Societal Risk Assessment: How Safe Is Safe Enough' Held at General Motors, Warren, Michigan, October 1979.) (TRRL Supplementary Report No. 567)

Sabey, Barbara E.; Taylor, H.
Transport and Road Research Lab., Crowthorne (England). c1980; 29p.
Order as: **PB80-227945**; PC A03/MF A01

The paper reviews known risks on the highway in perspective with the options available for reduction of risk, illustrating principles from experience in Great Britain. Firstly, the overall risks of accident and injury on the highway are enumerated statistically in relation to the individual and to the Community. The subjective view of these risks is discussed in terms of public response to different situations and monetary values ascribed. A relatively objective assessment of risks associated with different factors has been obtained through a multi-disciplinary study of the contribution of aspects of highway design, vehicle condition, and road user behaviour to accident occurrence. Stress is laid on interactions between the road, the vehicle, and the road user. Other studies give quantification of risks for specific road engineering and environmental factors, and show how probability of injury may be related to vehicle design. The potential for reduction in accident or injury risk is examined in the light of known benefits from well tried countermeasures, and quantified in relation to road engineering and traffic management, vehicle design and use road user behaviour and road usage. Finally, risk factors are contrasted with remedial potential. Future directions for application of countermeasures to reduce risk and for research to enhance quantification of risk and identify new effective countermeasures are enumerated. (Copyright (c) Crown Copyright 1980.)

SEE ALSO: 03085

PREVENTIVE AND REMEDIAL MEASURES

03068 A Report on the Structuring of Traffic Accident Rescue Systems (Beitrag zur Konzeption von Verkehrsrettungsmitteln) *(in German)*

Bez, Ulrich

Technische Univ., Berlin (Germany, F.R.). 1980; 254p.

Order as: **PB82-106667**; PC A12/MF A01

The present paper defined, qualifies and quantifies the significant parameters of the rescue triangle MAN-MEDICINE-TECHNOLOGY. By using the definition and structuring of an 'absolute' and 'relative' transport trauma, an attempt is made to convert these parameters from Man and Medicine into a technical concept. Besides the noise, climatic, vibration and hygiene factors in traffic accident rescue systems, the endangering of personnel and patient, the ergonomy, the performance level of the personnel, the response time and costs are discussed. An analysis of the market-economic situation and development of a cost strategy are important considerations, in addition to the presentation of target conflicts and equations for conflict solution. The technical conception found is characterized by module technique with the use of series building-blocks and the development of subsystems with specific performance profile. In a concluding material analysis, weight, costs, safety are compared to energy consumption and fire-behavior, and the potentials for different material design.

03069 Assessment of Anti-Dazzle Screen on M6 (Report No. TRRL – LR – 955)

Walker, A. E.; Chapman, R. G.

Transport and Road Research Lab., Crowthorne (England). c1980; 25p.

Order as: **PB81-135121**; PC A02/MF A01

The effects of the presence of an anti-dazzle screen on the central reserve of a 19 km length of the M6 Midlands Link have been assessed in terms of accident occurrence, attitudes of road users, transverse positioning of traffic on the carriageway, and headlamp and lane usage. The report details the results of the accident study, covering reported injury and non-injury accidents. It concludes that the accident rate (per veh km) in the dark on the screened length was 44 per cent lower than would have been expected had there been no screen present. However, this result depends crucially on the reported number of non-injury accidents, and for injury accidents only there is no significant difference between screened and unscreened lengths. Results of the studies of the other aspects which were reported earlier are summarized. It is concluded that the anti-dazzle screen was effective in reducing glare, was acceptable in appearance, had no adverse effect on traffic, and was marginally beneficial in terms of accident reduction. (Copyright (c) Crown Copyright 1980.)

03070 Wet-Weather Accidents: What Can Road Authorities Do About Them?

Anon.

Institute for Road Safety Research, Voorburg (Netherlands). 1979; 21p.

Order as: **PB80-203250**; PC A02/MF A01

The Institute for Road Safety Research SWOV is conducting large-scale research into traffic hazards in the province of Noord-Brabant for that province's Council and the Minister of Transport and Waterways. Besides the specific problems in Noord-Brabant, research is also being carried out into more general problems. One such problem is the occurrence of accidents on wet road surfaces. Although the report is focused on the situation as regards Noord-Brabant provincial roads, much of the information is also useful for road authorities in other provinces of the Netherlands. The document discusses briefly the following topics: Accidents on wet road surfaces--extent and causes; The road authorities' task; (Establishing norms, Tracing locations with a comparatively large number of wet-weather accidents, At intersections, in bends and at places where the view is obstructed good road-surface quality is needed to prevent accidents on wet road surfaces); What action can the road authority take (Road design, Road pavement, Road maintenance); and Accident control on existing roads.

03071 The Use of Headlamps in Lighted Streets (TRRL Supplementary Report No. 435)

Reid, J. A.; Syed, B. I.

Transport and Road Research Lab., Crowthorne (England). c1978; 14p.

Order as: **PB80-151863**; PC A02/MF A01

Three surveys on the usage of headlamps in lighted streets were carried out in the winter months of 1976, 1977 and 1978 respectively. The 1976 and 1978 surveys were conducted by the Statistics Directorate of the Department of Transport, and were designed to assess the overall rate of usage of headlamps in Great Britain. The 1977 survey was conducted by the Transport and Road Research Laboratory, in order to measure changes since 1968/69 in the rate of headlamp usage in six large cities. The 1977 survey showed that headlamps usage in six cities is now much more prevalent than in 1968/69 in good as well as in poor lighting conditions.

03072 Chemical de-Icing of Roads: The Effect on Road Accidents (Report No. VTI – 145) *(in Swedish; English Summary)*

Andersson, K.

National Swedish Road and Traffic Research Inst., Linkoeping. 1978; 51p.

Order as: **N79-33106/2**; PC A04/MF A01

Three attempts to trace the effects of chemical deicing methods (salting) on traffic accidents are reported. Only police reported accidents on national roads during the winter are taken into account without distinction as to severity. An analysis of variance conducted between 1970 and 1974 does not show that salting effects the total number of accidents. Another analysis based on the road conditions in the winter of 1973 shows that on ice/snow the accident rate is 3 to 20 times higher than on dry ground, but this rate increases under light ice/snow conditions due to a surprise factor. A before-after study conducted in 1972 through 1973 and 1974 through 1975 on salted and unsalted roads shows that the accident rate is not changed by salting. However, as this is a nonexperimental study no firm conclusions can be drawn.

HUMAN FACTORS

TRAINING AND EDUCATION

03073 Economic Evaluation of Slippery Road Surface Systems for Driver Training Sites (Ekonomisk Bedoemning av Halksystem foer Trafikoevningsplatser) (Report No. VTI/Meddelande – 219) *(in Swedish)*

Carlsson, Hans-Erik
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 27p.

Order as: **PB82-106576**; PC A03/MF A01

An important aspect of driver training in a country such as Sweden is practice driving on a slippery surface simulating an ice covered road. Unfortunately, few facilities presently exist for such training. Studies are underway, however, to determine the optimum surface for training sites, taking into account the two major factors involved: creating a surface that will adequately simulate a slippery road such as those encountered in normal winter driving and finding a surface whose use will be justified from a financial standpoint. The present report examines efforts currently underway in Sweden and in other countries to solve the above-mentioned problems. So far, no completely satisfactory solution has been found. The following alternatives are currently under study: asphalt concrete with pitch seal; poured asphalt; cement concrete; basalt; artificially frozen surface. The first four of these surfaces are covered with water, polymer material, or fat/oil to make them slippery. The economic aspects of maintaining these surfaces are difficult to judge since experience is limited. Other economic aspects are examined in detail.

03074 A Comparison of Two Methods of Driver Testing (Report No. TRRL – LR – 931)

Fazakerley, J. A.; Downing, A. J.
Transport and Road Research Lab., Crowthorne (England). c1980; 17p.

Order as: **PB81-142416**; PC A02/MF A01

In order to compare advanced driving tests run by the Institute of Advanced Motorists (IAM) with Department of Transport (DTp) learner driver tests, TRRL Driving Consultants who had been DTp driving examiners, observed 120 IAM tests and assessed and marked faults according to DTp procedure. Although differences were found between the marking procedures in the two forms of tests, in 103 cases out of 120 there was agreement on pass/fail decisions. The total number of serious and dangerous faults recorded by the TRRL Driving Consultants increased as the test proceeded when the number of faults in each separate successive 30 minute period out of the 90 minute test was examined. The 'pass' rates based on the proportion of candidates who did not show such faults, decreased wih the duration of the driving test from 83 percent after 30 minutes to 52 percent after 90 minutes. (Copyright (c) Crown Copyright 1980.)

03075 Evaluating a Structured Approach to Teaching Driving Skills by Identifying Underlying Principles (TRRL Supplementary Report No. 577)

Wells, Pat; Downing, A. J.
Transport and Road Research Lab., Crowthorne (England). c1980; 27p.

Order as: **PB81-108706**; PC A03/MF A01

Some driving skills may be better learned if the learner driver is provided with principles which relate to safe driving actions to be taken. To test this two programmed texts were produced which covered the principles of (1) signals and interpretation of signals and (2) the safe gap which should be maintained around a vehicle. In three separate experiments, groups of army cadets, RAF trainees and pupils at commercial driving schools used the programmed texts. Results showed that all the groups benefitted from the use of the texts, reducing the incidence of driving faults related to signalling and safety gaps and improving their theoretical knowledge in these areas. (Copyright (c) Crown Copyright 1980.)

03076 Typische Fehlverhaltensweisen von Fahranfangern und Moglickeiten Gezielter Nachschulung (Typical Erroneous Pattern of Behavior of Learner Drivers and Possibilities of Selective Subsequent Behavior) *(in German, abstract in English)*

Bocher, W.; Kroj, G.; Pfafferott, I.; Sogemeyer, H.
Bundesantalt fuer Strassenwesen, Cologne (Germany, F.R.). 1977; 341p.

Order as: **PB80-198039**; PC A15/MF A01

A special analysis of official accident statistics and questionnaires served as a basis of the study. It was clear that drivers with up to 2 years driving experience were involved in accidents 2 to 3 times more often than drivers who held a driving license more than 6 years. The most important result was that drivers in the age group 25-55 who held a driving license less than 2 years, were not involved in substantially more accidents than drivers in the same age group who had more driving experience. The higher accident rate among younger drivers showed a specific tendency as well. The main reasons as determined by the police are: driving off the road and collisions with oncoming traffic in conjunction with excessive speed. Youthfulness and inexperience at the wheel were concluded to be significant factors in the connected attitudes and patterns of behavior.

03077 Motorcycle Training and Licensing in Japan (Report No. TRRL – LR – 916)

Russam, K.
Transport and Road Research Lab., Crowthorne (England). c1979; 25p.

Order as: **PB80-162407**; PC A02/MF A01

The author visited Japan in September 1978 to collect information on the licensing and training of motorcycle riders. Visits were paid to several motorcycle training schools to see at first hand the facilities available and the techniques of instruction used. The training in Japan was found to be strictly controlled, of a high standard and uses a considerable part of the road safety budget. While no national evidence was found which

indicated that training by itself was effective in reducing accidents some evidence indicated that training was an effective measure and the consensus of opinion in Japan is that training is an essential part of a road safety program. (Copyright (c) Crown Copyright 1979.)

03078 Car Driving Before and After Passing the Driving Test (Report No. TRRL – LR – 869)

Jenkins, D.
Transport and Road Research Lab., Crowthorne (England). c1979; 38p.

Order as: **PB80-105810**; PC A03/MF A01

A national sample of drivers taking the car driving test during 1974/75 received a postal survey on how they learned to drive, and those 47 percent who passed completed a further postal survey a year later on their mileage and accidents. Nearly everyone (94 percent) had lessons from a driving school, and many had instruction from friends and relatives as well, the average cost of learning coming to L130. Younger drivers did best on the driving test and also had the highest accident rates during their first year. Overall, the accident rate for the whole group of newly qualified drivers was higher than for experienced motorists particularly at night and possibly also in bad weather. (Copyright (c) Crown Copyright 1979.)

SEE ALSO: 03005; 03031

ATTITUDE SURVEYS

03079 A Survey Among Lorry Drivers About the Striking of Low Bridges (TRRL Supplementary Report No. 633)

Galer, Margaret
Transport and Road Research Lab., Crowthorne (England). c1981; 24p.

Order as: **PB81-215154**; PC A02/MF A01

An interview survey of 497 drivers of high vehicles was conducted in 1978. Lorry drivers' knowledge of the overall height of the vehicle plus any load being carried at the time was compared with actual height measurements. Although 95 percent of drivers interviewed claimed to know the height of their vehicles, only 185 drivers were accurate to within 3 in. either side of the correct height and 73 drivers were underestimating their vehicles' height by more than 3 in. Lorry drivers' knowledge of road signs relating to low bridges was also investigated. Seventy-two percent of lorry drivers were fully or acceptably correct in their understanding of the road sign 'Headroom at hazard ahead', but only 31 per cent were correct in their understanding of the road sign 'Available width of headroom at hazard'. (Copyright (c) Crown Copyright 1981.)

03080 Drivers Knowledge of Speed Limits: An On-Site Study (TRRL Supplementary Report No. 608)

Cameron, R. A.
Transport and Road Research Lab., Crowthorne (England). c1980; 27p.

Order as: **PB81-151276**; PC A03/MF A01

Before a driver can comply with a speed limit he must be informed what that speed limit is. The extent to which drivers did know what the speed limit was at four sites was investigated. Three of the sites were in a 30 mile/h speed limit and one site was in a 40 mile/h limit. Overall, 74 per cent of drivers gave the correct limit when asked but 26 per cent were unable to do so. Drivers were rather more likely to cite the correct speed limit in the 40 mile/h area and the repeater signs may be responsible for this. Interviews showed that the drivers relied to a large extent on speed limit signs to inform them of the speed limit and relatively few drivers were aware of the significance of the presence or absence of street lighting. Speed measurements on 'free-movers' showed that those who identified the limit correctly were rather more likely to comply with it. (Copyright (c) Crown Copyright 1980.)

03081 A National Survey of Drivers' Attitudes and Knowledge About Speed Limits (TRRL Supplementary Report No. 548)

Mostyn, Barbara J.; Sheppard, D.
Transport and Road Research Lab., Crowthorne (England). c1980; 35p.

Order as: **PB81-127805**; PC A03/MF A01

The introduction of a speed limit or increases in enforcement of speed limits can lead to reductions in accidents. Nevertheless, it seems that a large proportion of motorists break speed limits sometimes, and this report describes a survey among drivers to examine why this occurs. The survey was conducted in 1976. The study confirms some pilot research which showed that many motorists are not fully aware of how to recognize what speed limit applies to a stretch of road. Speed limits had been changed several times prior to the time of the survey, and this survey showed that many motorists were not aware of the speed limits which applied at that time. Motorists seem to think that speed limits are useful as guidelines and few feel that motorists should be left to decide appropriate speeds for themselves. Motorists favor quite severe punishments for those who exceed speed limits by 20 mile/h, particularly at the higher limits. Some 44 per cent of motorists say they do not wish to see speed limits changed. Some data are presented on which type of driver favors or disapproves of limits and some suggestions are made about ways in which knowledge might be increased about limits and where they apply. (Copyright (c) Crown Copyright 1980.)

03082 Incidence and Effects of Police Action on Motoring Offences as Described by Drivers (TRRL Supplementary Report No. 543)

Griffiths, R.; Davies, R. F.; Henderson, R.; Sheppard, D.
Transport and Road Research Lab., Crowthorne (England). c1980; 20p.

Order as: **PB81-100521**; PC A02/MF A01

The report describes a survey among drivers describing what action the police took in relation to minor violations, and the effect on the driver.

03083 International Drivers' Behavior Research Association Cross-National Attitudes and Opinions

Survey: Report of UK Findings (TRRL Supplementary Report No. 403)

Jenkins, D. G.
Transport and Road Research Lab., Crowthorne (England). c1978; 16p.

Order as: **PB-297 334/5SL**; PC A02/MF A01

As part of an international survey of drivers' attitudes to road safety, 1400 drivers in the UK were sent a questionnaire to elicit their opinions. The response rate (81%) was very good for a postal survey of this length. Overall, respondents had a pessimistic view of road accident trends, most believing that they would be more at risk in the future than they are at present, although road accidents have been decreasing in recent years. There was a general acceptance that seat belts were fairly effective in preventing injury in most accidents but a majority of the respondents were opposed to compulsory seat belt wearing. (Copyright (c) Crown Copyright 1978.)

03084 Drivers' Knowledge of Speed Limits: A Study Based on Police Records (TRRL Supplementary Report No. 382)

Cameron, R. A.
Transport and Road Research Lab., Crowthorne (England). c1978; 19p.

Order as: **PB-296 237/1SL**; PC A02/MF A01

Ignorance of speed limits might be one reason for non-observance. As an initial examination of the possibility that some drivers do not know what speed limit they should be observing, police reports of speeding cases were examined to see how many drivers said they did not know what the limit was. Nine percent said they did not know what the limit was, but it was not possible to distinguish between those who were genuinely ignorant of the limit and those who merely said they did not know in the hope of escaping prosecution. In almost half the cases examined, the drivers were recorded as having made no reply to the Police Officer when they were reported. The constraints on using data from police reports for research of this kind are discussed. (Copyright (c) Crown Copyright 1978.)

SEE ALSO: 03002; 03016; 03021; 03063; 03069; 03129

DRIVER PERFORMANCE

03085 Human Factors and Driving Performance (Report No. TRRL – LR – 1004)

Quimby, A. R.; Watts, G. R.
Transport and Road Research Lab., Crowthorne (England). c1981; 42p.

Order as: **PB-142001**; PC A03/MF A01

The relative importance of a variety of human factor variables to driving performance was investigated using a representative sample of 60 drivers. Factors considered included: visual and perceptual abilities, risk taking, reaction time measures, biographical, attitudinal and personality variables and physiological measures of stress. Driving performance was assessed by obtaining accident and exposure histories for the previous 3 years and also by considering the number of driving errors committed on a test drive. In the analysis special attention was given to identifying any age differences revealed by the results that might help to explain why accident rates vary with age. Results indicated that the variable measuring risk taking was most highly correlated with driving performance. The driver's attitude to safety and measures of visual and perceptual abilities, such as acuity, risk assessment and hazard perception - measured both on the road and in a simulator - were also relatively important. Additional variables that were significantly correlated with driving performance included; age, socioeconomic group number, annual kilometers driven, additional driver training, one personality factor and a physiological measure of stress. Several of the variables showed significant age effects. The findings are discussed and their importance to road safety is considered. (Copyright (c) Crown Copyright 1981.)

03086 Survey of Visual Acuity of Drivers (Report No. TRRL – LR – 945)

Davison, P. A.; Irving, A.
Transport and Road Research Lab., Crowthorne (England). c1980; 25p.

Order as: **PB81-135089**; PC A02/MF A01

Data are presented on the distribution of binocular visual acuity for 1368 drivers at 25 sites using a British Standard test chart rather than a vision screening device. Assuming that the Department of Transport number plate test is equivalent to an acuity standard of between 6/12 and 6/9, it is estimated that between 1 per cent and 3 per cent of all drivers would fail the test at any given moment. Acuity was found to decline with age for drivers aged over 40 years. Five per cent and 10 per cent respectively of drivers aged 65 or over failed to meet the criteria of 6/12 and 6/9. A quarter of all drivers tested were actually wearing spectacles or contact lenses prior to driving up to the testing station; only 15 (4 per cent) of these drivers were wearing contact lenses. Questionnaire responses indicated that 64 per cent of all drivers claimed to have had some form of eye test within the previous 3 years. The effects on drivers' acuity of type and use of optical prescription, and of length of time since last eye examination, are reported. (Copyright (c) Crown Copyright 1980.)

03087 The Drinking Road User in Great Britain (TRRL Supplementary Report No. 616)

Sabey, Barbara E.; Staughton, G. C.
Transport and Road Research Lab., Crowthorne (England). c1980; 16p.

Order as: **PB81-142440**; PC A02/MF A01

The magnitude and nature of the problem of alcohol and road accidents in Great Britain has been monitored through special returns of Blood Alcohol Concentration (BAC) in fatalities, through routine reporting of positive screening (breath) tests recorded by the Police for drivers involved in injury accidents, and through records of offenses related to motor vehicles. The involvement of different road users is considered. Recent epidemiological studies are outlined, which give a new insight (albeit limited) into

drinking habits and characteristics of offenders, and report on the role of drinking pedestrians in accidents. Although there is some evidence that the acceleration of the drink/driving problem has been checked, alcohol remains a major factor in the occurrence of road accidents. The data presented reinforce the need to strengthen legislation to deal with drinking and driving, including publicity to all road users, and to continue with supporting research activities to identify more effective countermeasures. (Copyright (c) Crown Copyright 1980.)

03088 Traffic Information Broadcasting: Driver Reaction to Two Kinds of Traffic Message – A Pilot Study (TRRL Supplementary Report No. 603)

Owens, D.
Transport and Road Research Lab., Crowthorne (England). c1980; 21p.

Order as: **PB81-138083**; PC A02/MF A01

Results are presented of a study which examined drivers' ability to interpret and use information broadcasts about road traffic incidents to find alternative routes. The experiment was designed to simulate some of the characteristics of an operational dedicated traffic broadcasting system by presenting drivers with messages concerning a major, though hypothetical, incident along the route they were travelling. Two kinds of traffic message were compared: one containing details of a recommended alternative route, the other merely informing drivers of the presence of a road blockage. All messages gave details of the nature, location, duration and expected delays resulting from the incident. The main criterion adopted for assessing message effectiveness was the proportion of drivers who successfully avoided the blockages described in the broadcasts; a secondary analysis evaluated and compared the generalized costs of successful diversions. Overall, three-quarters of the journeys resulted in successful diversions. Drivers given positive diversion advice were generally more successful than other drivers although their diversion route costs were about the same. As expected, knowledge of the local road networks contributed to successful navigation round the blockages. (Copyright (c) Crown Copyright 1980.)

03089 The Effect of Biorhythms on Road Accidents (TRRL Supplementary Report No. 535)

Palmer, Phyllis O.
Transport and Road Research Lab., Crowthorne (England). c1979; 27p.

Order as: **PB81-108680**; PC A03/MF A01

It has been suggested that drivers have a higher risk of road accidents on 'critical' days in any of their supposed physical, emotional, or intellectual biorhythm cycles: the risk increases when 'critical' days in any tow cycles coincide and is greatest when three 'critical' days coincide. An investigation of the theory was carried out at the Transport and Road Research Laboratory using data from an insurance company on a large sample of drivers involved in accidents. The sample consisted of 112 560 drivers of whom 96 283 were men (Group M) and 16 277 women (Group F); 39 586 of the men (Group MB) and 6876 of the women (Group FB) were considered blameworthy, 51 254 men (Group NMB) and 8504 women (Group FNB) were considered not to blame; the rest were classified as 'blame not known'. Statistical tests were made for groups M, MB, MNB, F, FB and FNB, of various combination of possible 'critical' days in each separate cycle and in each two cycles taken together. Convincing evidence was not found to support the biorhythm theory. Accidents occurring when three 'critical' days coincide have not been fully studied but an example indicates that these occur very rarely. (Copyright (c) Crown Copyright 1979.)

03090 Aspects of Road Layout that Affect Drivers' Perception and Risk Taking (Report No. TRRL – LR – 920)

Watts, G. R.; Quimby, A. R.
Transport and Road Research Lab., Crowthorne (England). c1980; 26p.

Order as: **PB81-108490**; PC A03/MF A01

The report describes perceived risk situations, on a defined driving course in England. The drivers were surveyed to determine their assessments of environmental problems.

03091 A Review of Drinking and Drug-Taking in Road Accidents in Great Britain (TRRL Supplementary Report No. 441) (Text of a Paper presented to the Joint Conference of the American Association for Automotive Medicine and the 7th International Association for Accident and Traffic Medicine, at Ann Arbor, Michigan, July 1978)

Sabey, Barbara E.
Transport and Road Research Lab., Crowthorne, (England). c1978; 13p.

Order as: **PB80-115900**; PC A02/MF A01

The current situation concerning alcohol and drugs in road accidents in Great Britain is reviewed. A decade after the introduction of legislation imposing a legal limit of 80mg/100ml alcohol in the blood of drivers, the paper examines the evidence available on the involvement of different road users in alcohol related accidents, together with the trends over the years. Action arising out of the Blennerhassett Committee of Inquiry into Drinking and Driving is reported. An exploratory investigation of the role of drugs in accidents, based on very limited epidemiological evidence for accident involved drivers and a general sample of drivers, shows that fairly substantial numbers of men and women take therapeutic drugs before driving: sufficient numbers to claim that this subject cannot be dismissed as insignificant without further investigation. In studies so far no evidence has been found to suggest that there is any material problem with use of narcotics or hallucinogens (including cannabis) in Great Britain, and cases of drug abuse amongst drivers are rare. Future research needs and proposals are discussed. (Copyright (c) Crown Copyright 1978.)

03092 The Driving Simulator Developed by the Institute for Perception TNO. A Validation Study in

Straight Road Driving. Progress Report (Report Nos. IZF-1978-16-PR-1; TDCK-70887) *(in Dutch, Summary in English)*

Blaauw, G. J.; Vdhorst, A. R. A.; Godthelp, J.
Institute for Perception RVO-TNO, Soesterberg (Netherlands). 1978; 30p.

Order as: **N79-18588/0SL**; PC A03/MF A01

Inexperienced as well as experienced drivers had to drive in the simulator on a straight freeway. Results were compared with the data of a similar full-scale study with an instrumented car on the road. In both experiments the driver task was manipulated by specific instructions for lateral and longitudinal vehicle control. Especially, in lateral vehicle control the simulator appeared to differ from real driving in an absolute as well as relative way. It seems necessary to measure the dynamics of the simulator and instrumented car accurately and to modify the dynamics of the simulator in closer correspondence with the instrumented car. Only then it makes sense to continue closed-loop (validation) experiments.

03093 Male and Female Car Drivers: Differences Observed in Accidents (Laboratory rept. TRRL – LR – 761)

Storie, Valerie J.
Transport and Road Research Lab., Crowthorne (England). 1977; 30p.

Order as: **PB-280 877/2SL**; PC A03/MF A01

As part of an in-depth study made of 2654 car drivers involved in 2036 accidents over a 4-year period differences in the driver characteristics of men and women and the kind of human errors they made have been investigated. While the analysis showed some significant differences between the sexes in the type of accidents and the sort of error committed, basically there was little difference in the proportion of males and females who were regarded at fault; the figure being approximately 60 per cent of drivers for both sexes. The female driver tended to make errors of a perceptual nature by becoming distracted and not seeing hazards, she was less experienced in comparison with the male driver and found the right turn maneuver difficult especially when entering a major road. On the other hand the male driver was more likely to be impaired through alcohol, tended to drive too fast for the conditions and more readily took risks. (Copyright (c) Crown Copyright 1977.)

03094 A Reanalysis of California Driver Vision Data: General Findings (Laboratory rept. TRRL – LR – 768)

Hills, B. L.; Burg, A.
Transport and Road Research Lab., Crowthorne (England). 1977; 44p

Order as: **PB-280 862/4SL**; PC A03/MF A01

Data on over 14,000 drivers from the 1967 California driver vision study have been reanalyzed with a view to establishing their implications for driver vision standards. For the main analysis the sample was divided into four age groupings: Under 25, 25-39, 40-54, and over 54. The most consistent result throughout the study has been the failure to find a direct relationship between poor visual performance and high accident rates for young and middle-aged drivers. For the over 54 age group, dynamic and static visual acuity showed the most consistent relationships with accident rates but for an individual driver their accident prediction value remained very low. A more detailed age analysis failed to define more precisely the age at which these relationships develop. No evidence was found to support the use of total visual field as a driver screening test. The results for two tests of night vision were regarded as inconclusive for the over 54 age group. For the same nominal standard of binocular static visual acuity, the Ortho-Rater screener was found to fail markedly fewer drivers than the Snellen wall chart. The implications of varying the cut-off scores for each test were investigated, and the suggestion made that perceptual rather than sensory tests with greater accident predictive power would be needed before acceptable alternative screening methods could be specified for driver licensing purposes. (Copyright (c) Crown Copyright 1977.)

03095 'AWARE' an In-Vehicle Visual Communication System for Drivers (TRRL Supplementary Report No. 286)

Lines, C. J.; Hodge, A. R.
Transport and Road Research Lab., Crowthorne (England). 1977; 22p.

Order as: **PB-276 833/1SL**; PC A02/MF A01

This report describes a possible method of communicating with drivers using a fascia-mounted visual display. The system would warn of road conditions ahead and give instructions or advice including diversionary and navigational information. Messages to be relayed to drivers would be selected at a control office, based on information about prevailing traffic conditions. The messages would be sent in digital form via land-lines from the control office to the relevant road site where buried induction loops would continuously transmit the message. On passing these loops, the fascia-mounted display units would indicate the message by illuminating legends and digits. The front face of the display unit could readily be changed to provide for other languages. Small scale experiments carried out at the Laboratory have shown that drivers can readily assimilate information by this means, giving confidence that a full-scale communication system on the lines described could be implemented using known technology. (Copyright (c) Crown Copyright 1977.)

03096 Estimation of Distances While Driving (TRRL Supplementary Report No. 262)

Burney, Georgina M.
Transport and Road Research Lab., Crowthorne (England). 1977; 11p.

Order as: **PB-276 404/1SL**; PC A02/MF A01

The instantaneous judgment of distance is frequently required during driving, e.g., in judging the distance necessary to brake safely from a particular speed and in the estimation of distances which would allow safe overtaking. In some overtaking situations, it may be the perception of relative rather than absolute distances which

is important. The present study investigated how capable drivers were at making absolute and relative distance judgments from a vehicle travelling at a range of speeds. Drivers had to say when they were a particular distance (1000 ft) from various 'targets' along a specified route, they then had to either halve or quarter this distance. It was found that in relative judgments, the shorter the overall distance the driver was required to fractionate the more accurate was his judgment; although in general, drivers did tend to over-estimate distances relative to each other, i.e., the fractions were always larger than required. Estimates of relative distances unlike those of absolute distances, were unaffected by speed.

SEE ALSO: 03009; 03012; 03014; 03017; 03020; 03059; 03063; 03076; 03077; 03078

PEDESTRIAN SAFETY

ROAD SAFETY

03097 Effects of the Road Safety Organization Campaign for 'Disadvantaged Road Users' (Effekten av Trygg Trafikk's Kampanje 'De Svake Trafikantene') *(in Norwegian)*

Glad, Alf
Transportoekonomisk Inst., Oslo (Norway). Nov. 79; 34p.

Order as: **PB82-156092**; PC A03/MF A01

The report presents an effect-study of the campaign 'The disadvantaged road-users'. The campaign was conducted by sending out a brochure attached to motoring magazines. Interviews showed that the brochure reached 1/3 of Norwegian households, but only 11% of the population above fourteen years had read it. The reader-group had somewhat better knowledge of the campaign-message than had a non-reader group.

03098 Readability of Road Safety Publications (Report No. TRRL – LR – 944)

Sheppard, D.; Harrison, C.
Transport and Road Research Lab., Crowthorne (England). c1980; 12p.

Order as: **PB81-135063**; PC A02/MF A01

Standard tests of 'readability' were applied to several road safety texts. One was found to be 'fairly difficult to read', although there were considerable variations in scores between texts. One text was re-written applying principles known to affect readability and comprehension. Standardized tests indicated that this did improve comprehension quite markedly and specially-designed multi-choice tests also showed that those who had read the re-written text had more knowledge of the topic that was covered than those who had read th original version. Suggestions are made as to how texts on road safety might be written more effectively. (Copyright (c) Crown Copyright 1980.)

03099 Age-Related Differences in the Road Crossing Behaviour of Adult Pedestrians (Report No. TRRL – LR – 933)

Wilson, D. G.; Grayson, G. B.
Transport and Road Research Lab., Crowthorne (England). c1980; 22p.

Order as: **PB81-142408**; PC A02/MF A01

Pedestrians aged 60 years or more have a fatal and serious casualty rate relative to their numbers in the population that is more than twice that of other adults. In an attempt to explain this difference a large scale study of age effects on adult road crossing behaviour has been undertaken. The results showed that compared with other adults, the elderly were more likely: (1) to delay before crossing: (2) to spend more time at the curb; (3) to take longer to cross the road; and (4) to make more head movements before and during crossing. However in absolute terms these and other differences were small, and provided little explanation for the differences in casualty rates. The results indicated that the elderly employed a different crossing strategy from that of other adults, but in general the elderly do not appear to form a distinct sub-group within the pedestrian population. (Copyright (c) Crown Copyright 1980.)

03100 Teachers' and Children's Reactions to the 'Safemobile' Visiting Their Schools (TRRL Supplementary Report No. 937)

Valentine, Shelagh D.; Davies, R. F.; Sheppard, D.
Transport and Road Research Lab., Crowthorne (England). c1980; 24p.

Order as: **PB81-133191**; PC A02/MF A01

The report describes the reactions of primary school teachers and students to a mobile road safety exhibit. The exhibit was divided into two age groups. In some schools, the teachers prepared the children and in some, follow-up work was done.

03101 Elderly Pedestrians: Assessments of the Relative Value of Instruction on Alternative Safety Topics (TRRL Supplementary Report No. 601)

Sheppard, D.; Valentine, Shelagh D.
Transport and Road Research Lab., Crowthorne (England). c1980; 18p.

Order as: **PB81-131831**; PC A02/MF A01

Road Safety Officers with experience of accident prevention work with the elderly, were asked to rate 58 topics which might be included in road safety instruction to elderly pedestrians. The ratings were for importance for safety and for likelihood that elderly pedestrians would do what was advocated after instruction or publicity on that topic. Ratings for importance and likelihood of adoption proved to be closely correlated, but though RSOs felt that most of the items were 'important' or 'very important', it was usually thought that only 'some' would follow the advice. A priority order for these topics was produced based on these assessments. (Copyright (c) Crown Copyright 1980.)

03102 The Traffic Environment of Preschool Children in Sweden – Translation (Report No. VTI/Saertryck – 44) (Pub. in Proceedings of a paper presented to the Symposium of Safety of Pedestrians and Cyclists in Paris, France, May 14-16, 1979)

Arnberg, Peter W.

Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1979; 25p.

Order as: **PB81-124596**; PC A02/MF A01

A survey of nearly 300 preschools in Sweden with 10,000 children has recently been carried out. Responses to questionnaires sent out to preschool personnel (response rate of 95%) and the children's parents (response rate of 70%) have provided information concerning, among other areas, the traffic environment surrounding the preschools and the children's mode of transportation and route to/from school. Time of the year as well as the effect of where in Sweden the preschool was located were studied. Accidents and near accidents were also studied during the period January, 1977, to May, 1978.

03103 Road Safety and Value for Money (TRRL Supplementary Report No. 581) (Paper presented to the Seminar 'Road Safety – Remedial Action and the Local Authorities' Organized by the Institution of Municipal Engineers in London, October 1979)

Sabey, Barbara E.

Transport and Road Research Lab., Crowthorne (England). c1980; 23p.

Order as: **PB81-100604**; PC A02/MF A01

The current state of knowledge on factors which may aid decisions to achieve value for money in road safety is outlined. The discussion includes consideration of the monetary value placed on road accidents, the basis for assessment of priorities, contributory factors in accidents, and the options for remedial action in the fields of road engineering, vehicle design and usage, and human behavior. Assessments are made of the relative costs of implementation of, and likely returns from, different remedial options. It is concluded that in seeking priorities for action to reduce the road accident toll, a balance between short and long term returns needs to be made. Where Local Authorities are concerned, the short term benefits will undoubtedly come from application of low cost road engineering measures. Education, training and publicity have their place in support of engineering measures, and will assume even greater importance in the long term. (Copyright (c) Crown Copyright 1980.)

03104 The Effects of Installing an Audible Signal for Pedestrians at a Light Controlled Junction (Report No. TRRL – LR – 917)

Wilson, D. G.

Transport and Road Research Lab., Crowthorne (England). c1980; 15p.

Order as: **PB80-227309**; PC A02/MF A01

The report describes a study on behavior of pedestrians before and after installing an audible signal at a crossing.

03105 A Study of a Road Safety Film for Children (TRRL Supplementary Report No. 578)

McGarvie, Averil; Davies, R. F.; Sheppard, Elizabeth J.

Transport and Road Research Lab., Crowthorne (England). c1980; 20p.

Order as: **PB80-227028**; PC A02/MF A01

The report describes the reactions of a group of school children to a film which illustrates points of traffic safety.

03106 Merkblatt zur Gestaltung und Sicherung von Schulwegen (Instructions for the Design and Safety of Children's Ways to School) *(in German, abstract in English)*

Anon.

Bundesanstalt fuer Strassenwesen, Cologne (Germany, F.R.). 1977; 57p.

Order as: **PB80-198005**; PC A04/MF A01

In order to provide the public and private institutions who concern themselves with the safety of children's ways to school with the necessary information to fulfill their task, instructions are issued which confront examples of the design of ways to school with the laws in force, other rules and regulations and research results in this field. The instructions contain suggestions with regard to community development planning, transportation plan, road design, traffic rules and regulations, boundaries of school districts, participation in traffic under the guidance of third persons, children's equipment (clothes, bicycles) and traffic education. Those ways to school are dealt with which can be walked or driven by bicycle. The problems of motorized students or students transported by school busses are given marginal attention only. For the persons responsible and those affected, the instructions contain a catalog of possible measures which, taking account of the local conditions prevailing, can be laid down in the form of maps of ways to school.

03107 Strassenverkehrsbeteiligung Alterer Menschen (Elderly People as Road Users) *(in German, abstract in English)*

Wittenberg, Reinhard

Bielfield Univ. (Germany, F.R.). Fakultaet fuer Soziologie. *Bundesanstalt fuer Strassenwesen, Cologne (Germany, F.R.). 1977; 337p.

Order as: **PB80-196074**; PC A15/MF A01

The objective of this investigation was to collect basic data on the nature, duration and frequency as well as the purpose and the aim of the participation of elder people in traffic in the Federal Republic of Germany. By means of a multilevel selection procedure and questionnaire inquiries combined with an analysis of the time distribution of the type of participation in traffic, data on the behavioral attitudes of elder people in traffic was collected. The age of the road users observed had been limited by the authors to at least 60 years. The discussion on the characteristics and behavior patterns of this group as well as the justification of the methodical approach are followed by the description of the ecological and regional aspects of the way of life of the questioned group. The questionnaire findings and the results of the analyses of participation in traffic are provided with a special distinction made between time, regional, and personal influence factors. Some comments on the involvement in accidents and on safe (or unsafe) feelings of elder road users as well as suggestions about measures aiming at improving road safety and proposals on initiation of new research activities complete this report.

03108 Pedestrian Safety: The Role of Research (TRRL Supplementary Report No. 319) (Paper presented at World Conference on Transport Research, Held at Rotterdam (Netherlands), on April 26-28, 1977)

Taylor H.
Transport and Road Research Lab., Crowthorne (England). c1977; 37p.

Order as: **PB-284 972/7SL**; PC A03/MF A01

Pedestrian safety is today a matter for concern in most countries on account of the relatively high level of casualties and the difficulty in identifying worthwhile measures that have the prospect of making substantial improvements in the situation. In 1975 a combined OECD-ECMT group on pedestrian safety research was set up to study research needs in the field of pedestrian safety in relation to the policy orientation defined by the ECMT and other responsible international bodies. The Special Research Group is concentrating on the following priority areas for international co-operative research: (1) technical improvements to the pedestrian's road environment (pedestrian crossings: location, form, signs, signals, and markings, lighting, etc.); (2) road safety education; (3) information and education campaigns on the theme of pedestrian safety using the mass media. Two other important subjects, namely the influence of alcohol and the question of vehicle design for greater pedestrian safety, were excluded from the work of this Group but are receiving attention under other international programs. (Copyright (c) Crown Copyright 1977.)

03109 The Psychology of Children in Traffic (TRRL Supplementary Report No. 295)

Russam, K.
Transport and Road Research Lab., Crowthorne (England). 1977; 20p.

Order as: **PB-276 915/6SL**; PC A02/MF A01

The importance of psychology of children in traffic as a particular area of study by the Transport and Road Research Laboratory rests on the belief that from observations and investigations of the behavior of children interacting with vehicles will come information which can be used to improve their safety. The TRRL program of research, summarized in this paper, includes co-operative studies with the police and other bodies as well as research funded at universities. In addition to the classes of study given above, the program also includes studies of children's understanding of road safety and the development of teaching aids to be used in road safety education.

SEE ALSO: 03050; 03071; 03153

PEDESTRIAN ACCIDENTS

03110 Pedestrian Accidents (Final rept. RS-225)

Golden, J. M.
Foras Forbartha, Dublin (Ireland). Mar. 80; 152p.

Order as: **PB81-242000**; PC A08/MF A01

The report examines the nature and dimensions of the problem of pedestrian safety in Ireland insofar as this can be done from accident data alone; it reviews as much as is feasible the international literature on the subject. Based on the conclusions the report discusses possible measures to improve pedestrian safety, which may be applicable to the Irish situation. The extent to which these measures have been evaluated is also examined.

03111 Pedestrian Fatalities: A Comparison of Experience in the United States of America and in South Africa during the Year 1976-1978 (Technical rept. RY/9/79)

O'Day, J.; Pretorius, H. B.
National Inst. for Transport and Road Research, Pretoria (South Africa). Sep. 79; 16p.

Order as: **PB81-216251**; PC A02/MF A01

The co-author of this report, H. B. Pretorius of this Institute, visited the Highway Safety Research Institute of the University of Michigan (HSRI) in the USA for the period 1 July 1979 to 4 September 1979. In collaboration with Mr. J. O'Day, Head of System Analysis (HSRI) he compared the pedestrian fatalities of the USA and SA with respect to age groups VS hour of the day. It is observed that in both countries one particular problem area is accidents involving 5 and 6 year old children after school. The reason for the differences between the other groups is not clear but differences in the environment and weather may be a major factor.

03112 An Assessment of the Role of Motion Prediction in Child Pedestrian Accidents (TRRL Supplementary Report No. 320)

Kenchington, Mary J.; Alderson, G. J. K.; Whiting, H. T. A.
Transport and Road Research Lab., Crowthorne (England). 1977; 19p.

Order as: **PB-277 353/9SL**; PC A02/MF A01

A recent series of experiments examined 'motion prediction' performance, and discussed its significance for the behavior of children in traffic situations. Using a constant velocity linear motion paradigm, it was shown that young children tend to be more variable and to make more frequent 'early' errors than did older ones in predicting the time of co-incidence of a moving object with a stationary point. In a comparison of child pedestrian road accident victims with matched controls on a laboratory motion prediction task, the victims performed with greater variability of error, comparable with that expected of younger children. In addition, these wide distributions were centered on smaller 'early' errors than those of the control children, indicating a bias towards responding later in time. This tendency to make 'later', highly variable predictions might be one reason why the victims had been involved in accidents. Further research is required to establish the validity of this suggested relationship between ability to predict motion and involvement in pedestrian accidents.

03113 Research and Development Towards Improved Protection for Pedestrians Struck by Cars (TRRL Supplementary Report No. 238)

Harris, J.
Transport and Road Research Lab., Crowthorne (England).

1977; 22p.

Order as: **PB-276 192/2SL**; PC A02/MF A01

In Great Britain in 1974, approximately 40 per cent of all fatal road casualties were pedestrians. Accidents between cars and pedestrians accounted for approximately 70 per cent of all these casualties and this paper considers features of car front end design which may reduce the frequency and severity of injury. Results of car impact tests on pedestrian dummies representing adults and 6 year old children are given, and these data related to information obtained from accident investigations. It is concluded that wherever possible, a pedestrian should be projected to come to rest on the bonnet rather than knocked down in front of the car or thrown over the bonnet or roof to the ground. A low mounted energy absorbing bumper and an energy absorbing bumper and an energy absorbing bonnet leading edge with crush characteristics matched to appropriate human tolerance levels, could accelerate a pedestrian to the velocity of the impacting car with less injury from the initial impact than occurring with existing designs. Fatal and other head injuries from vehicle impact may be reduced by ensuring head impact with the bonnet rather than the windscreen surround. Preliminary design parameters for providing these features are discussed. (Copyright (c) Crown Copyright 1977.)

SEE ALSO: 03036; 03037; 03051; 03099

MOTOR VEHICLES

DESIGN AND TESTING

03114 Masking of Brake Lights by High-Intensity Rear Lights in Fog (Report No. TRRL – LR – 998)

Helliar-Symons, R. D.; Irving, A.

Transport and Road Research Lab., Crowthorne (England). c1981; 19p.

Order as: **PB82-122672**; PC A02/MF A01

In fog the conspicuity of a vehicle may be increased by using high-intensity rear lights. However, these lights can be much brighter than the vehicle's brake lights and may mask them if they are installed too close to them. An experiment to investigate the effect of increasing the separation between these lights and the brake lights was conducted in artificial fog at TRRL. A rear light display of two brake lights and two high-intensity rear lights was situated in the peripheral visual field of the subject who had to react to the brake light onsets. At the same time subjects performed a second task, demanding similar concentration to driving, which also simulated a driver being distracted from looking straight ahead. Subjects reacted more quickly and missed fewer presentations as the separation between the brake lights and high-intensity rear lights was increased. The greatest improvement in performance occurred when the angular separation, between the lights as measured from the subject's viewpoint, was changed from zero (the lamps touching) to 5.7 minutes of arc with smaller further benefits occurring with angular increases up to 17 minutes of arc. It is suggested that a minimum separation between the different types of lamp of 100 mm would be the most suitable since this would meet the 5.7 minute of arc criterion during following at high speed in thin fog and would exceed this at the shorter viewing distances likely in thicker fogs. (Copyright (c) Crown Copyright 1981.)

03115 Travel Report – Visit at GM and Ford (Reserapport – Studiebesoek pa General Motors Proving Ground, Milford, Michigan, USA och Ford Safety Department, Dearborn, Michigan, USA, Juli 1979) (Report No. VTI/Meddelande – 185) *(in Swedish)*

Loenn, Christer

Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 18p.

Order as: **PB82-105693**; PC A02/MF A01

The National Road and Traffic Research Institute's (VTI) technical resources for collision tests are in general compatible with those of the American auto-industry. The most marked difference is the calibration of test dummies where VTI totally lacks resources but where GM and Ford have invested large amounts. The calibration equipment refers to head, neck, chest and legs/knees. For heads they use fall tests, the other calibration 'stations' are swing weights. GM's calibration equipment was easy to work with and well planned. Small details in the design separated GM from Ford. GM and Ford have each about 10 persons whose only jobs are calibrating and reparing dummies. VTI's lack of equipment for calibrating dummies results in a reduced capability to perform tests in accordance with international rules and regulations. It also becomes more difficult and sometimes even impossible to compare our test results with others. The dummies are an important link in a measurement system where all other equipment is carefully calibrated. 'No chain is stronger than its weakest link' which in VTI's case refers to the dummies.

03116 An Analysis of Bus Defects, Their Consequences and Methods for Remedying Them (Research rept. RR-29)

Jenkins, Ian A.

Newcastle upon Tyne Univ. (England). Transport Operations Research Group. Jul. 79; 63p.

Order as: **PB81-202327**; PC A04/MF A01

The report describes a study into the problems for both the bus operator and the passenger of bus defects which are reported by drivers while during or out of service. Analyses have been carried out using historical data on the frequencies of occurrence of defects, times of service depletion and overall repair times for several different bus types from a few urban bus operators in Britain.

03117 Efficiency of Spray Protectors: Tests 1979 (Report No. VTI – 199)

Sandberg, Ulf

Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 95p.

Order as: **PB81-168221**; PC A05/MF A01

With the purpose to investigate the efficiency of some new spray protector

designs for heavy vehicles, tests have been made of spray generation from four trucks, of which two were equipped with new spray protectors. The experiments were made on an artificially watered test track with 1 - 1,5 mm water depth at 80 km/h. The intensity of the spray was measured by special measurement equipment, which in principle is measuring the light transmission loss caused by spray in different positions and directions in relation to the vehicle. The report contains an extensive description of the measurement and evaluation technique and also presents a collection of measured spray propagation curves behind the vehicle. An analysis is also made of details in the spray measurements and the consequences of this for some of the spray protectors. Based on the results some recommendations are given concerning possible improvements in splash and spray protection on heavy vehicles.

03118 Barriaerkollision med Ambulans (Barrier Collision Test with an Ambulance) (Report No. VTI/Meddelande – 206) *(in Swedish. Summary in English and Swedish)*

Turbell, Thomas
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 32p.

Order as: **PB81-141723**; PC A03/MF A01

The present Swedish requirements on the collision safety in ambulances are restricted to general recommendations like 'The interior shall be made such as no injuries will occur'. This type of requirements are of course very difficult to expound since there are no indications of the type and severity of the collision for which the requirements have to be met. In order to initiate a development in this field and get some information on the present situation a 'standard' barrier collision at 52 kmph has been made with an old ambulance. Before the test a number of 5 50-percentile test dummies were installed in positions regarded as typical for an emergency mission. One dummy simulated a patient on the stretcher. All dummies used existing restraint systems.

03119 Taklastens Inverkan pa Personbilars Koeregenskaper (The Effects of Roof Load on the Driving Characteristics of Passenger Cars) (Report No. VTI – 172) *(in Swedish. Abstract and summary in English)*

Magnusson, Georg
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1978; 108p.

Order as: **PB81-128993**; PC A06/MF A01

A study has been carried out at the National Swedish Road and Traffic Research Institute with the objective of determining the influence of the roof load on the driving characteristics of passenger cars. The study comprises a literature survey, a theoretical analysis by data simulation and experimental studies of the overturning risk, maneuverability and sensitivity to side-winds. The experimental studies have been carried out with the aid of a Volvo 142 having a load up to 120 kg on the roof rack or in the rear boot. The ratings of the overturning limit showed that the studied vehicle rather skids than overturns at large side accelerations on roads with normal friction conditions also when the heaviest roof load was tested. The literature survey has proved the need for more extensive studies especially regarding small vehicles and vehicles with limited roll stiffness.

03120 Aquaplaning Tests, 1967 to 1969. Investigation of Braking Action Developed by Motor Car Wheels (Report No. VTI/Meddelande – 193)

Nilsson, A.; Ohlsson, E.
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 87p.

Order as: **PB81-128753**; PC A05/MF A01

The National Swedish Road Research Institute has carried out an investigation dealing with the reduction in braking action on water covered road surfaces. An account is given of the theories of friction involved in rubber and in materials which are rigid in comparison to rubber. A review of the existing theories of aquaplaning is followed by definitions of the concepts of inertial aquaplaning and viscous aquaplaning. Field tests have been carried out with a friction test vehicle constructed at the Institute. The tests have shown that the braking action on a road surface completely covered with water is substantially reduced compared to the braking action on the same surface in the merely wet condition. This decrease takes place as soon as the speed exceeds a certain definite value. The decrease in the braking action occurs at a higher speed if the pavement surface is made rougher and if the tire is provided with a more effective tread pattern. A greater effect on the braking action is produced by increasing the roughness of the road surface than by improving the tread pattern of the tire.

03121 Friktionsmaetning pa Rullbanor och Vaegar (Friction Measurements on Runways and Roads) (Report No. VTI – 177) *(in Swedish. Abstract in English)*

Ohisson, Evert
National Swedish Road and Traffic Research Inst., Linkoeping. 1979; 70p.

Order as: **PB81-126807**; PC A04/MF A01

Satisfactory tire friction is an indispensable condition for safe road traffic and safe aircraft ground operation. This report begins with some simple, fundamental friction theories. Differences between aircraft tires and car tires are discussed. Special attention is paid to the hydroplaning phenomena. Then different methods to measure runway and road friction are discussed and critically examined. The different methods are examplified by descriptions of some realized test devices. The possibility to standardize a friction test method for runways and roads is discussed and the need for a standard test tire is emphasized in the conclusion.

03122 Containment of Heavy Vehicles by Bridge Parapets of Post and Rail Type (Report No. TRRL – LR – 884)

Jehu, V. J.; Pearson, L. C.
Transport and Road Research Lab., Crowthorne (England). c1979; 16p.

Order as: **PB81-106452**; PC A02/MF A01

The containment capability of post and rail parapets depends, iter alia, on the post spacing. To provide quantitative data on this behavior, the increased containment obtained by having the post spacing has been measured in dynamic tests using 5 ton coaches impacting the parapet at 30 degrees. It was found that an aluminum P1 parapet with 3m post spacing did not contain a coach which struck it with the same severity as the P1 car impact. When the post spacing of the aluminum parapet was halved to 1.5m it withstood a 2 x P1 impact from a coach equivalent to the impact of a 20 ton vehicle at 58 km/h and 15 degrees. Having the post spacing of a steel P1 parapet from 3.66m to 1.83m increased its containment capability from 1.6 x P1 impact to 3.2 x P1 impact, a high level of containment equivalent to the impact of a 20 ton vehicle at 71 km/h and 15 degrees. (Copyright (c) Crown Copyright 1979.)

03123 Vapour Lock in Car Braking Systems (Report No. TRRL – LR – 903)

Keen, J.
Transport and Road Research Lab., Crowthorne (England). c1979; 33p.

Order as: **PB81-104044**; PC A03/MF A01

The effect of water contamination on brake fluid performance was assessed, partly by measuring fluid temperature under a variety of conditions, but also by analyzing fluid from two samples of cars to obtain information on water contents of fluids in cars on the road. Water contents of one per cent in current brake fluids reduce the vapor lock from around 250C to around 180C. Further increases have progressively less effect. Comparative tests to measure fluid temperatures were carried out on the track using nine different models of car. In addition fluid temperatures in the braking system of one car were measured under a variety of conditions on the road. (Copyright (c) Crown Copyright 1979.)

03124 Accident Investigation Techniques for Assessing Vehicle Safety Features (TRRL Supplementary Report No. 551) (Paper presented to the International Technical Conference on Experimental Vehicle Safety (7th), Held in Paris, France, June 1979)

Sabey, Barbara E.
Transport and Road Research Lab., Crowthorne (England). c1980; 15p.

Order as: **PB80-227960**; PC A02/MF A01

The paper describes recent progress in the UK towards developing a multi-level system of accident investigation specifically related to vehicle secondary safety. The application of the national police statistics to determine priorities, the extension of local in-depth investigations for furthering the understanding of injury mechanism, and proposals for an intermediate level system for monitoring changes in vehicle safety features on a sample basis are outlined. The Co-ordination of activities between 3 teams involved in studying injury causation and alleviation (at the Transport and Road Research Laboratory, Birmingham Accident Research Unit, and Oxford Road Accident Group) is an important part of the work. A procedure is being developed for harmonizing accident investigaton techniques - for the study of biomechanics of injury for car occupants in particular - while enabling the teams to retain their own specific objectives and local interests. The current three year programme (1978-1981) of research studies is summarized. (Copyright (c) Crown Copyright 1980.)

03125 A Review of the Anthropometric and Strength Standards of the Canadian Motor Vehicle Safety Standard (Report No. DCIEM-80-R-29)

Noy, I.; Taylor, M.; Beevis, D.
Defence and Civil Inst. of Environmental Medicine Downsview (Ontario). Feb. 80; 31p.

Order as: **AD-A088 468/4**; PC A03/MF A01

This paper reviews the anthropometric and strength criteria used by the CMVSS to specify vehicle design limits. The review was concerned with two main objectives: To review the format and content of the CMVSS to ascertain whether the criteria contained therein are the most pertinent to vehicle safety characteristics and whether such criteria are presented in the most effective way possible; Two review available US and Canadian anthropometric literature to determine the extent to which existing data can be applied to standards for the design of vehicles for Canadian drivers and the cost/benefit of undertaking a comprehensive survey to provide more reliable data. (Author)

03126 Automotive Diagnostic and Service Equipment and Accessories (Korea) (Foreign market survey rept.)

Anon.
ASI Market Research, Inc. (Korea). *International Trade Administration, Washington, DC. 31 Mar. 80; 36p.

Order as: **DIB-80-07-504**; PC$10.00/MF A01

The market research was undertaken to study the present and potential US share of the market in Korea for automotive diagnostic and service equipment and accessories; to examine growth trends in Korean end-user industries over the next few years; to identify specific product categories that offer the most promising export potential for US companies; and to provide basic data which will assist US suppliers in determining current and potential sales and marketing opportunities. The trade promotional and marketing techniques which are likely to succeed in Korea were also reviewed.

03127 Application of the Calspan CRASH Program under European Conditions (TRRL Supplementary Report No. 528)

Staughton, G. C.; Jennings, P. W.
Transport and Road Research Lab., Crowthorne (England). c1979; 14p.

Order as: **PB80-162431**; PC A02/MF A01

The report describes an assessment of the use of the Calspan CRASH program for simple collision reconstruction under European conditions. The program has been tested by checking its predictions for frontal and side impacts against the measured results of controlled collisions for a variety of cars

in common use in Europe. Errors in estimates of impact speeds and delta v introduced by limiting the input data have been made in order to assess the extent to which the program can be used when incomplete 'at-the-scene' data are available. Application of the program to reconstruct accidents investigated at-the-scene over a period of six months has shown the severe limitations on the full use of the program under British conditions. Possibilities for partial application are considered and needs for developing the program are discussed. (Copyright (c) Crown Copyright 1979.)

03128 Accidents Involving Heavy Goods Vehicles in Great Britain: Frequencies and Design Aspects (TRRL Supplementary Report No. 470)

Neilson, I. D.; Kemp, R. N.; White, H. A.
Transport and Road Research Lab., Crowthorne (England). c1979; 16p.

Order as: **PB80-147671**; PC A02/MF A01

The purpose of this paper is to present an overall view of the contribution that heavy goods vehicles make to the road accident situation, this being one factor of importance in considering goods transport by road. This overview is based on the accident situation in Great Britain, mostly for the year 1974, but it probably reflects the situations in other European countries. The second half of the paper discusses the desirable accident avoidance features that can be built in to heavy goods vehicles by affecting their handling and braking. Injury protection for occupants can also be improved, but the major problem is injuries caused to other road users and design features are discussed which should reduce these injuries. (Copyright (c) Crown Copyright 1979.)

03129 A Canadian Survey of Automobile Tire Pressures, Tire Failures and Tire Maintenance Practices (Report No. 79-RSU-40)

Attwood, Dennis A.; Williams, Raymond D.
Transport (Canada) Downsview (Ontario) Road Safety Unit. Nov. 79; 49p.

Order as: **AD-A080 324/7**; PC A03/MF A01

Previous limited tire pressure surveys have suggested that the tire pressures on Canadian vehicles are critically low and could be resulting in an abnormally high number of tire failures. Many tires examined by Transport Canada as a result of complaints of alleged safety defects were found to have failed as a result of underinflation. In December, 1978, Transport Canada initiated a national tire maintenance survey that was designed to: obtain a nationally representative sample of tire pressures to determine whether out-of-limits pressures were a serious problem; record driver maintenance habits and characteristics and attempt to relate these to tire pressures (the strength of these relationships could suggest potential countermeasures if a tire pressure problem existed); and obtain cursory information on the number and types of tire failures that have occured over the last three years. The survey data were obtained from interviews with 745 householders selected at random from across the country. The data obtained from each interview included the sex and age of each driver, the physical properties of the tires on his or her vehicle, the reported vehicle and tire maintenance habits of each driver, and the number and types of tire failures that he or she may have experienced in the past. (Author)

03130 An Evaluation of Anti-Burst Door Latches for Cars (TRRL Supplementary Report No. 490) (Prepared in cooperation with Birmingham Univ. (England)., and Cranfield Inst. of Tech. (England))

Read, P. L.; Griffiths, D. K.; Gloyns, P. F.; Lowne, R. W.
Transport and Road Research Lab., Crowthorne (England). c1979; 57p.

Order as: **PB80-106560**; PC A04/MF A01

This report describes the performance of door latches in accidents and in laboratory tests. It results from cooperation between the Accident Research Unit of the University of Birmingham who studied the accident data, the School of Automotive Studies of the Cranfield Institute of Technology who carried out the testing and the Transport and Road Research Laboratory who contributed to the analysis. The incidence of car door openings during accidents is outlined and latch types are ranked according to their observed performance in accidents. All the anti-burst latches discussed satisfy ECE Regulation 11 which is currently required. It tests latches as separate entities without any of the vehicle and door structures to which they are attached. The development of a procedure to test latches when mounted in vehicle structures is described. This test was performed on a range of vehicles corresponding with those studied in the accident survey. The performance rankings from these tests are compared with the accident survey ranking and a good correlation is shown. The results of a set of ECE 11 tests are shown for comparison. An analysis combining the accident survey and laboratory test data allows an estimate to be made of the effect on door opening rates in accidents if a vehicle bodyshell latch test were to be instigated. (Copyright (c) Crown Copyright 1979.)

03131 Safety During Special Transportation Service Trips. Volume One: Transportation in Vehicles Designed for the Handicapped

Aldman, Bertil; Brattgard, Sven-Olof; Hansson, Soren
California State Div. of Mass Transportation, Sacramento. Chalmers Univ. of Technology, Goteborg (Sweden). Inst. for Traffic Safety. Goteborg Univ. (Sweden). Div. for Handicapped Research. Urban Mass Transportation Administration, Washington, DC. Oct. 74; 122p.

Order as: **PB-294 969-T/SL**; PC A06/MF A01

Special transportation is provided in Sweden for those who have difficulty in using the regular public transportation systems. The vehicles used for the special transportation are generally small buses and all are equipped with a ramp or a small elevator to move the passengers into or out of the vehicles. Inside of the vehicle, seats have been removed and special fastening equipment for wheelchairs has been installed. Travel service can be divided into three main parts: (1) moving to or from the vehicle; (2) moving

into or out of the vehicle; and (3) traveling in the vehicle. The University of Goteborg conducted studies on the safety aspect of loading and securing wheelchairs in this type of transportation service. This report covers the wheelchair-securing portion of the study. A related study: Volume Two: Movement In and Out of Special Transportation Service Vehicles (PB-289 132-T), deals with safety factors during the movement into and out of the vehicles. In the studies described, dummy-occupied wheelchairs were dynamically tested on a sled simulator while secured by various methods. Six different types of chairs were tested. Crash simulations were made at acceleration levels of 5g, 10g, 15g, and 20g, and all occurring under at least 100ms from onset. The report concludes that satisfactory securement can be provided for forward and rearward-facing wheelchair users on the special transportation vehicles. However, sideway facing is not advisable because of the low tolerance of the human body to side stresses.

03132 Articulated Vehicle Roll Stability: Methods of Assessment and Effects of Vehicle Characteristics (TRRL Supplementary Report No. 788)

Kemp, R. N.; Chinn, B. P.; Brock, G.
Transport and Road Research Lab., Crowthorne (England). c1978; 45p.

Order as: **PB-284 513/9SL**; PC A03/MF A01

Nine high laden articulated vehicle combinations from 32 tons (Mg) to 45 tons (Mg) gross train weight were driven into a roll over condition on different maneuvers to assess their stability in roll and the effect of different vehicle characteristics. The vehicles were also tilted sideways on a platform to the point of balance. Roll over occurred at lateral accelerations from about 0.2g. Trailer roll was the governing factor in the overturning of the combinations tested. Increased spring stiffness, spring base width and coupling stiffness increased the trailer roll resistance. Measurements demonstrated that the tilt method gave a good indication of roll stability. Calculated results from a computer program of lateral acceleration required for roll over differed from the dynamic results by 10 to 40 per cent. Roll over occurs in 3-4 per cent of heavy goods vehicle injury accidents. A higher percentage of articulated vehicles roll over than rigid vehicles. Reasons for this are considered to be geometric layout, lack of driver awareness of the total roll of an articulated combination and a tendency for a rigid vehicle to become self stabilizing due to loss of drive in roll. Multiple turn maneuvers did not increase the risk of roll over. A roll over warning device could be useful. (Copyright (c) Crown Copyright 1978.)

03133 Brake System Defects in Cars Not Involved in Accidents (Report No. TRRL – LR – 803)

Kemp, R. N.
Transport and Road Research Lab., Crowthorne (England). c1977; 23p.

Order as: **PB-281 409/3SL**; PC A02/MF A01

One thousand cars as used on the roads and 100 cars in breaker yards were examined for brake system defects by an engineer of Automotive Products Ltd under contract to the Laboratory. The object was to indicate the extent of defects occurring in different components of the systems and the factors which may contribute to the number of defects. Twenty-eight per cent of the 1000 cars had one or more wheels considered to be out of adjustment or to have inoperative adjusters and forty per cent had other defects. None of the 584 cars given a performance test however failed to reach the legal minimum requirement for the service brake of 0.5g. Of the factors considered age, mileage and periodic servicing appeared to affect the number of defects. The frequency of periodic servicing however, did not appear significant. The effects of these defects on brake performance and stability are considered and suggestions are made for reducing their frequency. Conclusions are reached on the necessity for improvements for improving safety by comparing these findings with those of cars involved in accidents. An accident study suggested three per cent of accidents might be attributed to poor braking and these were mostly loss of control. This report suggests that a higher standard for braking deceleration in service would lead to reductions in impact speeds in many accidents. (Copyright (c) Crown Copyright 1977.)

03134 Measurement of Skidding Resistance. Part IV. The Effect on Recorded SFC of Design Changes in the Measuring Equipment (TRRL Supplementary Report No. 346)

Hosking, J. R.; Woodford, G. C.
Transport and Road Research Lab., Crowthorne (England). 1978; 20p.

Order as: **PB-279 124/2SL**; PC A02/MF A01

The development of a machine (SCRIM) for the routine measurement of resistance to skidding from the earlier research machines has inevitably led to design changes that have been made in the interests of greater reliability, greater precision of measurement and to overcome problems associated with commercial production. This Report describes a study of the effect that these changes have had on test results. This study showed that SFC levels have increased by between 19 and 28 per cent and that three classes of factors have contributed approximately equally to the increase, namely: (a) change from test car to SCRIM, (b) change of test tire and (c) improvements in test equipment. It was also found that it would not be practicable to reduce SFC levels by more than a proportion of this increase. Alternative courses of action are available --- (1) Revise published findings based on earlier results to bring them into line with present-day figures; (2) Adjust present-day results to bring them into line with the published figures. The second course has the advantage that any further changes in SCRIM could be easily accommodated and published SFC levels will remain valid. (Copyright (c) Crown Copyright 1978.)

03135 Accidents to Articulated Vehicles Fitted with Load Sensing or Anti-Locking Brakes to Counteract Jack-Knifing (TRRL Supplementary Report No. 222)

Wilkins, H. W.

Transport and Road Research Lab., Crowthorne (England). 1977; 15p.

Order as: **PB-276 128/6SL**; PC A02/MF A01

Earlier work has shown load sensing valves to be effective against jack-knifing. The work described in this report compares antilocking brakes with load sensing valves in this respect. The trials lasted four years and involved some 400 articulated vehicles; half of these were fitted with anti-locking brakes on the drive axles, and the rest had load sensing valves. All the vehicles operated under similar conditions of normal commercial operation. These vehicles were involved in 478 road accidents which were analyzed and assigned to various categories. Although the numbers of accidents are too small to be significant, the vehicles with anti-locking brakes had fewer jackknifing accidents than those with load sensing valves. Earlier work has shown that vehicles with load sensing valves had significantly fewer jack-knifing accidents than those without any anti-jack-knifing equipment. The results did not show much difference, either in total number or type, between the accidents of the vehicles with anti-locking brakes and those of the load sensed vehicles. This is to be expected, because the equipment under trial would be likely to affect only those accidents involving jack-knifing and these are relatively few. (Copyright (c) Crown Copyright 1977.)

SEE ALSO: 03113; 03176

SAFETY FEATURES

03136 Use and Effects of Seat Belts in 21 Countries

Berard-Andersen, Karin

Transportoekonomisk Inst., Oslo (Norway). Jan. 78; 46p.

Order as: **PB82-149477**; PC A03/MF A01

Through several years the positive effect of seat belt use has been documented. This report presents recent wearing rates and the latest documentation of the injury-reducing effect of seat belt wearing.

03137 Use of Seat Belts and Crash Helmets in Norway, 1973-77 (Bruk av Bilbelter og Hjelmer i Norge, 1973-77) *(in Norwegian)*

Anon.

Transportoekonomisk Inst., Oslo (Norway). Jan. 78; 25p.

Order as: **PB82-148313**; PC A02/MF A01

The report summarizes studies carried out by the Institute of Transport Economics during the years 1973-77 concerning drivers' use of seat belts and motorcyclists' use of helmets. The frequency of use has been registered at a large number of sites throughout the country in the years 1973, 1976 and 1977. Counts have also been carried out 4-7 times per year in a limited number of checkpoints in cooperation with the state Motor Vehicles Control. A sample of drivers has also been interviewed in 1975, 1976 and 1977 to determine attitudes use of seat belts. Motorcycle- and moped-riders' use of helmets has been registered together with the seat belt registration from 1974 onwards.

03138 The Initial Impact of the Safety-Belt Legislation in Ireland (Report No. RS – 255)

Hearne, R.

Foras Forbartha, Dublin (Ireland). Jun. 81; 21p.

Order as: **PB82-121377**; PC A02/MF A01

The wearing of safety-belts by front seat occupants of cars and light vans was made compulsory in the Republic of Ireland from February 1, 1979. This report considers the effect of the law during the first eleven months of its operation on wearing rates and on the overall severity of injury to car drivers. It is shown that wearing rates doubled from one in four-prior to the law's introduction to one in two subsequently. The effect of this increase on the severity of injury to car drivers was minimal. Where information was available on safety-belt wearing, the proportion of car drivers killed or seriously injured subsequent to the laws introduction was 27.4% compared with 27.7% beforehand. The report considers these figures in somewhat more detail and offers some tentative explanations for these results.

03139 Skyddssystem foer Barn i Bilar. Foeraeldrars Montering av Bilbarnstolar och Foerslag till nya Bilbarnstolsinstruktioner (Child Restraint Systems for Children. Parents Installation of Child Seats and Suggestions for New Instructions) (Report No. VTI – 122) *(in Swedish. Abstract in Swedish and English)*

Arnberg, Peter W.; Ercisson, Anna-Lena

Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1977; 24p.

Order as: **PB81-128464**; PC A02/MF A01

As part of a series of studies investigating the use of rearward-facing car child seats, a study was carried out in which problems in connection with the installation of the seats were investigated. The study consisted of both questionnaires sent to approximately 2,000 parents having children in day nurseries and an experiment in which 21 parents attempted to install (under observation) different types of approved seats. The experiment, with which this report is concerned, was carried out in two phases: (1) The installation of the subjects' own seat in their own car, and (2) the installation of three other approved seats, which was done in cars of the same make as the subjects' own car. The purpose of the experiment was two-fold: (1) To study ways in which the instructions for the installation could be improved, and (2) to gain information concerning ways in which the attachment of the seat could be simplified, which could be passed on to seat manufacturers.

03140 The Protection Afforded by Seat Belts (TRRL Supplementary Report No. 449)

Grime, G.

Transport and Road Research Lab., Crowthorne (England). c1979; 25p.

Order as: **PB80-127186**; PC A02/MF A01

The paper presents a summary of information on the protection afforded by seat belts, and on the effectiveness of legislation in persuading people to wear the seat belts fitted to their cars. Summaries are given of 8 selected European and American papers on seat belts in accidents. The estimated

reductions in serious injuries varied from 45 percent to 70 percent, and reasons are suggested for the occurrence of these differences. The most serious injuries, particularly to the head, were probably reduced more than the less serious ones, and ejection was almost eliminated. Australian experience in the State of Victoria leads to the conclusion that seat belts reduce deaths of car occupants by at least 40 percent. After the introduction of legislation in Australia and New Zealand the percentages of car occupants wearing belts rose eventually to 80 or 90 percent even in towns. If legislation were to have the same effect on wearing rates in Great Britain, the expected decreases in deaths and serious injuries, on the basis of the 1976 casualty figures would be about 630 deaths and 12,900 serious injuries per annum. (Copyright (c) Crown Copyright 1979.)

03141 The Edge-Locking Performance of Some Seat Belt Inertia Reels (Report No. TRRL – LR – 882)

Lowne, R. W.; Roberts, A. K.; Watts, G. R.
Transport and Road Research Lab., Crowthorne (England). c1979; 30p.

Order as: **PB80-105844**; PC A03/MF A01

Current accident experience clearly shows the benefits of wearing seat belts both of the static and the inertia reel variety. This report describes tests performed on some designs of inertia reel seat belts to identify possible problems relating to the malfunction of the locking mechanism under heavy braking or impact conditions. The study shows that with some designs there is a slight but significant risk that such malfunctions can occur. (Copyright (c) Crown Copyright 1979.)

03142 The Effectiveness of Seat Belts in Reducing Injuries to Car Occupants (Report No. TRRL – LR – 811)

Hobbs, C. A.
Transport and Road Research Lab., Crowthorne (England). c1978; 23p.

Order as: **PB-300 334/0SL**; PC A02/MF A01

Detailed investigation of over 1,100 accidents, representative of all injury severities, has shown that car occupants who were wearing seat belts sustained substantially fewer injuries than those who were not. Seat belts reduct injuries by restraining the wearer, so reducing the likelihood of violent contact with the vehicle interior and by preventing ejection from the vehicle. Where injuries to belt wearers did occur, the main problem was still occupant to vehicle contact, exacerbated by distorted parts of the vehicle intruding into the passenger compartment, rather than direct seat belt loading. A comparison between automatic and static lap and diagonal seat belts showed that overall, both performed equally well in alleviating injury, but there was an indication that automatic belts were more likely to be worn than static ones. (Copyright (c) Crown Copyright 1978.)

03143 Aspects of Car Design and Child Restraint Systems (Presented at the Conference on Children, the Environment and Accidents', Medical Commission on Accident Prevention and the Dept. of Child Health, University of Newcastle-upon-Tyne, 24-25 Sep. 76.) (TRRL Supplementary Report No. 296)

Lowne, R. W.
Transport and Road Research Lab., Crowthorne (England). 1977; 21p.

Order as: **PB-277 033/7SL**; PC A02/MF A01

Methods of protecting children against injury in car accidents are described, and the problems raised by the anatomical differences between children and adults. Results are presented of investigations into accidents involving children including accidents where child restraints were used. The data indicate that children are injured less often in car accidents than adults and are safer in the rear seats than in the front. Accident investigations including a study of serious accidents, indicate that safety restraints to current British standards are effective in reducing the number and severity of injuries to child car occupants. (Copyright (c) Crown Copyright 1977.)

03144 Alleviation of Injuries by Use of Seat Belts (TRRL Supplementary Report No. 289)

Sabey, Barbara E.; Grant, B. E.; Hobbs, C. A.
Transport and Road Research Lab., Crowthorne (England). 1977; 9p.

Order as: **PB-276 837/2SL**; PC A02/MF A01

The paper presents some results of very recent studies of occupant injury. These studies were specifically designed to give a representative sample of vehicle occupants, including the uninjured, ie to cover the whole range of levels of injury. One of the main aims was to assess the effectiveness of belts in terms of risks of injury related to severity, location, and nature of the injury.

SEE ALSO: 03027; 03049; 03083; 03178

MOTORCYCLES AND PEDAL CYCLES

03145 Injury Patterns of Motorcyclists Involved in Accidents (Paper presented to the International Conference of the International Association for Accident and Traffic Medicine (8th) held at Aarhus, Denmark in June 1980.) (TRRL Supplementary Report No. 651)

Harms, P. L.
Transport and Road Research Lab., Crowthorne (England). c1981; 20p.

Order as: **PB81-228157**; PC A02/MF A01

Two injury studies are reported: a two-year hospital sample of 766 motorcycle casualties treated at one major accident hospital and a separate one-year sample of 41 fatally injured motorcyclists. National accident data indicate that motorcycle riders have a higher overall death and injury rate compared to car drivers in relation to their respective average distances travelled. In addition, motorcycle fatalities account for 55 per cent of road accident deaths in the 17-19 year age group. Engineering solutions are suggested aimed at improving machine handling and

preventing high deceleration forces being applied to the vulnerable body regions of the motorcyclist following accidental impact. Improvements in protection for the lower leg and the need for better understanding of the mechanism of brain injury which may lead to a possible improvement in helmet design are also suggested.

03146 Pedal Cycle Conspicuity (Technical rept. RV/1/79

Sator, W. H. J.
National Inst. for Transport and Road Research, Pretoria (South Africa). Oct. 79; 41p.

Order as: **PB81-216244**; PC A03/MF A01

Local and overseas research has shown that a lack of rear conspicuity in pedal cycles plays a major role in serious accidents involving these vehicles. The results of a survey showed that almost all pedal cycles on South Africa roads were not conspicuous at a 'safe distance' from the rear at night. This was mostly due to inadequate rear retro-reflectors. A large proportion of these retro-reflectors are imported and do not comply with the Road Traffic regulations. Experiments were conducted to establish the reflective value of an effective retro-reflector. Recommendations are made for increasing pedal cycle conspicuity.

03147 Koerriktningsvisare pa Moped – En Undersoekning (Direction Indicators on Mopeds – A Survey) (Report No. VTI/Meddelande – 231) *(in Swedish; summary in Swedish and English)*

Oestroem, Carl-Adolf
Statens Vaeg- och Trafikinstitut, Linkoeping (Sweden). 1980; 40p.

Order as: **PB81-172041**; PC A03/MF A01

This report describes a study of direction indicators for mopeds. The purpose of the study was to give a basis for a decision on a possible change of the Swedish law regarding direction indicators and also a basis for the work on ECE regulations.

03148 Daytime Motorcycle Conspicuity (Prepared in cooperation with Loughborough Univ. of Technology (England). Inst. for Consumer Ergonomics.) (TRRL Supplementary Report No. 625)

Fulton, E. J.; Kirkby, C.; Stroud, P. G.
Transport and Road Research Lab., Crowthorne (England). c1980; 25p.

Order as: **PB81-165078**; PC A02/MF A01

The report investigates the reasons for low visibility of motorcycles in traffic and suggests methods for increasing the visibility.

03149 A Survey of Motorcycle Accidents (Report No. TRRL – LR – 913)

Whitaker, J.
Transport and Road Research Lab., Crowthorne (England). c1980; 54p.

Order as: **PB81-134975**; PC A04/MF A01

This survey looks at a sample of 450 injured motorcyclists involved in 425 accidents over a period of one year (1974). A comparison of several aspects of the accident situation between the sample and national accident data indicated that the detailed information gained from the survey is representative of motorcycle accidents reported nationally by the police. The study examines the accident situation, causes of injury to riders, crash helmet performance, and the motorcycles involved. Some of the main findings are:- (1) The high incidence of accidents where other road users fail to see the motorcyclist while negotiating a junction. Thus the motorcycle is usually travelling at between 20-30 mile/h just prior to the accident. (2) Other vehicles were the main cause of serious injuries to motorcyclists. Riders' legs were particularly prone to severe injury. (3) There was some evidence that helmets conforming to the higher British Standards slightly reduced the likelihood of head injury below that for lower standard helmets. The use of full face helmets was shown to reduce the chance of facial injury. (Copyright (c) Crown Copyright 1980.)

03150 Cycling as a Mode of Transport (Proceedings of a Symposium Held at Crowthorne, England on 25 October 1978. Prepared in cooperation with the Institution of Highway Engineers.) (TRRL Supplementary Report No. 540)

Transport and Road Research Lab., Crowthorne (England). c1980; 116p.

Order as: **PB80-227929**; PC A06/MF A01

Contents: Cyclists' touring club centenary; Cycle use in Britain; Cycle safety; Legal aspects; Design criteria; Cycle routes in the Hague and Tilburg; Bikeway demonstration program -- an overview; Cycle routes in Peterborough. (Copyright (c) Crown Copyright 1980.)

03151 Grundlagen zum Zweiradverkehr (Fundamentals of Two-Wheel Traffic) *(in German, abstract in English)*

Anon.
Bundesanstalt fuer Strassenwesen, Cologne (Germany, F.R.). 1977; 141p.

Order as: **PB80-198021**; PC A07/MF A01

In order to provide a comprehensive basis for information and study purposes on the subject of two-wheel traffic, the data available in the Federal Republic of Germany is summarized. An optimal value for a speed limit applying to light motorcycles is deduced with respect to traffic safety and to the possibly high acceptance by cyclists. Criteria for registration and use of light motorcycles are discussed in relation to other factors such as the behavior of driver and vehicle, driving education and traffic flow.

03152 Bicycle Safety Devices – Effects on Vehicle Passing Distances (TRRL Supplementary Report No. 512)

Watts, G. R.
Transport and Road Research Lab., Crowthorne (England). c1979; 19p.

Order as: **PB80-161730**; PC A02/MF A01

Three devices designed to increase bicycle safety have been evaluated on rural and suburban roads. Two devices, a Swedish flag

and a Finnish disc, are mounted on the rear carrier or frame of the bicycle and project horizontally into the road on the offside. These devices are intended to increase the distances at which vehicles pass the bicyclist. The third device tested was a fluorescent waistcoat which is used as a conspicuity aid. A camera mounted on the rear carrier of a test bicycle allowed photographs of overtaking vehicles to be taken. From the photographs the passing distances were obtained. (Copyright (c) Crown Copyright 1979.)

03153 Comparison of On-Road and Off-Road Cycle Training for Children (Report No. TRRL – LR – 902)

Wells, Pat; Downing, C. S.; Bennett, Marie
Transport and Road Research Lab., Crowthorne (England). c1979; 31p.

Order as: **PB80-105596**; PC A03/MF A01

The report compares the reactions of children trained on bicycles and practicing on roads with those practicing in play grounds. Pedestrian child training is also evaluated.

03154 Impact Tests on Crash Helmets for Motor Cyclists (Report No. ARL/Struc. Note 445)

Hearn, N. D.; Sarrailhe, S. R.
Aeronautical Research Labs, Melbourne (Australia). Apr. 78; 36p.

Order as: **AD-A065 966/4SL**; PC A03/MF A01

Seven types of crash helmet were subjected to a series of impact tests as detailed in the current Australian Standard. Impact accelerations were usually less than 75% of the maximum permitted values, but second impacts near the front edge usually resulted in excessive accelerations. Four types of helmet, two with fibreglass shells and two with polycarbonate shells, were exposed to the weather for 15 to 17 months and one of the polycarbonate shells suffered degradation in its resistance to penetration. (Author)

03155 Safety Helmets for Pedal Cyclists – a Pilot Study Amongst Children (TRRL Supplementary Report No. 283)

Bennett, Marie; Downing, C. S.
Transport and Road Research Lab., Crowthorne (England). 1977; 23p.

Order as: **PB-276 666/5SL**; PC A02/MF A01

Twenty nine children aged 10-11+ were given the opportunity of wearing BSI approved safety helmets while taking part in a National Cycling Proficiency Scheme re-test in a school playground. They were afterwards questioned about the comfort of the helmets and the effect, if any, that wearing them had on their cycling. Most would like to own a helmet for cycling and said that they would wear it for most activities on their bicycles. Few children found the helmet uncomfortable or difficult to put on. Most complaints were associated with the chin strap. Some children (12) claimed that the helmet made looking behind more difficult; 6 were observed to have more difficulty in steering while looking behind when wearing the helmet than they did when not wearing it. These difficulties however, might have been attributable to the fact that the children did not have much time to become accustomed to wearing the helmets. (Copyright (c) Crown Copyright 1977.)

SEE ALSO: 03037; 03137

AIR TRANSPORTATION

TRAFFIC CONTROL AND AVIATION SAFETY

03156 Takeoff and Missed Approach under the Influence of Wind Shear (Start und Durchstart Unter Scherwindeinfluss) (flight safety considerations) (Report No. TUBS/SFB-58-80-05-01) *(in German)*

Koenig, R.; Krauspe, P.
Technische Univ., Brunswick (Germany, F.R.).Lehrstuhl fuer Flugmechanik. National Aeronautics and Space Administration, Washington, DC. May 80; 27p.

Order as: **N81-32131/7**; PC A03/MF A01

The effect of wind shear on flight performance and flight safety is examined. Loads on aircraft surfaces are quantized. Statutory regulations that concern takeoff and missed approach are considered. The effects of wind shear on takeoff, specifically regarding a missed approach to glide path, are then discussed. Air traffic control measures in consideration of wind shear are proposed.

03157 Midair and Near Midair Collisions on Two- and Three-Dimensional Curvilinear Flight Paths (Report No. DFVLR-FB-80-13) *(in German; English Summary) (Report will also be announced as translation – ESA-TT-685)*

Weber, O.
Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt e.V., Brunswick (Germany, F.R.). National Aeronautics and Space Administration, Washington, DC. Mar. 80; 108p.

Order as: **N81-13944/6**; PC A06/MF A01

Collision avoidance by means of the 'see and avoid' concept, advanced secondary radar systems on the ground, and independent electronic systems onboard is discussed. For two- and three-dimensional stationary turns, basic geometrical and physical aspects of conflict detection were derived and details given on the apparent size and motion of the other airplane on the windshield. For conflict warning by means of electronic systems on the ground or onboard, a linear track model was used.

03158 The D.R.C.S. Acoustic Sounding Facility at Edinburgh Airfield (Technical rept. ERL-0054-TR)

Tresidder, T. N.

Electronics Research Lab. Adelaide (Australia). Mar. 78; 76p.

Order as: **AD-A084 218/7**; PC A05/MF A01

The DRCS acoustic sounding facility at Edinburgh Airfield has been developed to enable the simultaneous comparison of the ability of three acoustic sounding techniques to measure wind velocity profiles in the lower atmosphere. The three techniques are monostatic doppler, bistatic doppler and angle-of-arrival operation. The antenna configuration, electronic equipment and performance parameters are described. (Author)

03159 Precision Navigation for Air Traffic Management Presented at the AGARD GCP Symposium (29th) on Oct. 79, at Copenhagen (Denmark) (Report Nos. DRIC-BR-72506; SRE-MEMO-3220)

Ratcliffe, S.
Royal Signals and Radar Establishment Malvern (England) Defence Research Information Centre, Orpington (England). Oct. 79; 9p.

Order as: **AD-A083 947/2**; PC A02/MF A01

This report discusses the problems that would arise if airspace users had the use of NAVSTAR or some other much better position-fixing aid than at present, and the uses that ATC could, or could not, make of this capability. There would be formidable transitional problems in the vertical plane, because NAVSTAR measures height from the Earth's centre whereas current altimeters measure atmosphere pressure. In either vertical or horizontal planes much work will be necessary to prove that the separation standards can be reduced at all. The paper discusses changes that might be possible in the ATC system should appreciable reductions in separation standards prove possible. NAVSTAR might form the basis of a collision avoidance system based on either the broadcast co-ordinates of each aircraft or on a time-frequency basis using NAVSTAR as the time reference. The latter scheme would offer protection of a fully-equipped aircraft against a threat that could not afford the expense of a NAVSTAR fit. This paper is a contribution to the 29th AGARD GCP Symposium, Copenhagen, Oct 1979. It is issued as a memo to make it available earlier and in an unclassified document. (Author)

03160 The Superposition of Two-Dimensional Error Fields and Its Influence on Flight Safety of Air Traffic – Tran-Translation No. ESA-TT-527-REV. (Die Ueberlagerung Zweidimensionaler Fehlerfelder und Ihr Einfluss Auf die Flugsicherheit im Luftverkehr. Dfvlr, Brunswick Report Dlr-FB-77-64, 21 Dec. 1978. Original German Report available from Dfvlr, Cologne Dm 27,20)

Weber, O.
European Space Agency, Paris (France). Inst. fuer Flugmechanik. Mar. 79; 59p.

Order as: **N80-13022/2**; PC A04/MF A01

The superposition of two dimensional error fields and their effects on air traffic flight safety are discussed. Local error fields significant with regard to flight safety are investigated and described by means of error ellipses, 95% circles, and other curves representing the same probability. Taking the upper wind field over Schleswig as an example, conclusions are drawn concerning the frequency distributions of asymmetrical real phenomena. Statistical laws for determining the mean error vector and the covariance matrix of a superimposed field from the corresponding values of the original normal distribution error fields are also discussed, and rules are given regarding the shape and the error contour area of the superposition. The safety cushion provided by the superposition of a ring shaped or extreme radical distribution with a normal distribution is contrasted to that provided by the superposition of two error fields having normal distributions.

03161 Comparison of Some Methods to Determine the Delays of Landing Aircraft with Respect to Runway Capacity (Report No. NLR-MP-77028-U)

Vandenwilt, M.
National Aerospace Lab., Amsterdam (Netherlands). Scientific Services. 3 Mar. 79; 34p.

Order as: **N79-32191/5**; PC A03/MF A01

The capacity of runways in use for landing aircraft can become the chief bottleneck as regards the capacity of airports. This runway capacity can result in long queues of aircraft waiting to land, which in turn results in unacceptable delays. Two analytic methods for determining these delays are described and the results are compared. The two methods differ in their modeling of the queueing system, which results in an optimistic and a pessimistic estimate of the delays. Finally, a model for Monte Carlo simulations is briefly described. The uncertainties in results obtained from this simulaton model are estimated.

03162 Recognition of the Aircraft Navigation Light Colour Code

Bowman, K. J.; Cole, B. L.
Melbourne Univ., Carlton (Australia). Coll. of Optometry. Sep. 79; 69p.

Order as: **N79-32186/5**; PC A04/MF A01

The sources of visual information for determining the risk of collision were examined and it was found that the navigation light system can serve as a crude screening method enabling categorization of intruder aircraft into 'potential threat' and 'no threat' categories. It was noted that the minimum intensities for navigation signals afford only a limited visual range which might be further reduced by high intensity presence lights. However, it was also found that the fixity of bearing criterion has a number of shortcomings: it is invalid when either aircraft is changing course or speed and it may require a long pick-up range and lengthy periods of unwavering observation of the relative position of the intruder aircraft. An experiment is described which shows that observers with normal color vision are able to determine aircraft aspect and relative heading from the navigation light code with a moderately high degree of reliability. The reliability of judgement is decreased by higher intensity presence lights especially when they are located close to the navigation lights.

SEE ALSO: 03177; 03183; 03185

ACCIDENT RESEARCH AND INVESTIGATION

03163 Disengagement of Safety Harness Buckles – CT4 (Rept. for Aug.-Dec. 79, No. ARL/STRUC-NOTE-469)

Sarrailhe, S. R.; Thomas, G. A.
Aeronautical Research Labs. Melbourne (Australia). Mar. 81; 25p.

Order as: **AD-A109 048/9**; PC A02/MF A01

During the crash of a CT4 Airtrainer in August, 1979 both safety harness buckles disengaged. The crash was very severe but the harnesses did not show signs of overloading. After a series of tests it was concluded that the buckles disengaged because of misalignment of the loads onto the buckle. This misalignment may not be represented in the standard test procedures and they may give a false sense of security. New tests are proposed, but further work would be desirable to establish design and test criteria. (Author)

03164 Trouble Shooting in Aeronautics and the Usefulness of Microscopes (Report No. VTH-LR-305) (Presented at 7th European Congr. on Electron Microscopy. Session on Impact of Electron Microscopy on Soc., The Hague, 25-29 Aug. 1980)

Schijve, J.
Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering. *National Aeronautics and Space Administration, Washington, DC. Sep. 80; 18p.

Order as: **N81-28069/5**; PC A02/MF A01

The usefulness of the scanning electron microscope and transmission electron microscope for materials fatigue investigations in aeronautics is illustrated by case histories of practical applications. Civil air safety as a motive for these studies is cited. The detailed examination of fracture surfaces on aircraft structures is described. Fatigue crack growth analysis, microscopical observation and fractography as part of accident investigations are reviewed.

03165 The Failure of Aircraft Structures (Report No. NLR-MP-78040-U) *(in Dutch; English Summary)* **(Presented at Bondsdag-Bond van Materialenkennis, Wageningen, Netherlands, 10 Nov. 1978)**

Degraaf, E. A. B.
National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Dept. National Aeronautics and Space Administration, Washington, DC. 6 Dec. 78; 36p.

Order as: **N80-23285/3**; PC A03/MF A01

A general discussion of aircraft structural failures and the design measures taken to prevent them are presented. Methods for determining static strength and stiffness, loads, and fatigue strength are surveyed. Modern design philosophies which take into account the possibility of initial defects, from which fatigue damage could originate are considered. Examples of structural failure are given and discussed.

03166 Failure Analysis in Aviation (Report No. NLR-MP-78028-U) *(in Dutch; English Summary)*

Degraaf, E. A. B.
National Aerospace Lab., Amsterdam (Netherlands). Structures Materials Dept. National Aeronautics and Space Administration, Washington, DC. 14 Aug. 78; 48p.

Order as: **N80-23284/6**; PC A03/MF A01

The role of service failure analysis in defining new inspection procedures and the adoption of existing ones is illustrated. Examples include failures detected during inspections prescribed by the manufacturer, failures discovered after having learned of problems experienced by other operators of the same type of aircraft, and those found after an accident or by chance.

03167 Aviation Safety and Its Improvement (De Veiligheid in de Luchtvaart en Haar Bewaking) (Report No. VTH-LR-260) *(in Dutch)* **(Conf-Presented at Symp. Veiligheid van de Vervoerssystemen, Delft, 17 Mar. 1978)**

Wittenberg, H.
Technische Hogeschool, Delft (Netherlands). Afdel. der Luchtvaart- en Ruimtevaarttechniek. Jan. 78; 55p.

Order as: **N80-18014/4**; PC A04/MF A01

A synopsis of 75 years of air transportation data was compiled in relation to aircraft accidents and aviation safety. Regulations covering aircraft construction, maintenance, aircraft control and navigation, training, and accident investigation are reviewed.

03168 Human Factors in High Speed Low Level Accidents – A 15 Year Review (Report No. DCIEM-79R35)

Rud, R. C.; Leben, D. F.
Defence and Civil Inst. of Environmental Medicine Downsview (Ontario). Jul. 79; 13p.

Order as: **AD-A076 221/1**; PC A02/MF A01

The Canadian Forces introduced the CF 104G into Squadron Operation in 1963 and since that time these aircraft have operated in the high-speed, low-level environment in both the strike/reconnaissance and tactical support roles. Fifty-seven accidents involving these aircraft are reviewed with regard to cause factors. Marginal weather appears to be the one most significant factor contribution to low-level, high-speed accidents; however, several human factors such as visual contrast problems, fatigue, stress, reaction time, 'mission completion' syndrome, inattention and task overload were identified. Aspects of accidents which typify human factors problems are described. Suggested possible preventive measures are outlined. (Author)

SEE ALSO: 03038

HAZARDS AND ACCIDENT PREVENTION

03169 Detection of Obstacles by Low Flying Aircraft using CO_2 laser; mathematical model (Report No. FOA-C-30227-E1)

Letalick, D.
Foersvarets Forskningsanstalt, Stockholm (Sweden). National Aeronautics and Space Administration, Washington, DC. Aug. 81; 42p.

Order as: **N82-15026/9**; PC A03/MF A01

A model which calculates reflection from cylindrical obstacle surfaces, e.g., power cables is presented. Measurements of reflection of 10.6 micron radiation from various types of wires, cables and framework are reported. The measurements were performed in the laboratory using a CO2 laser and direct detection, with the targets a few meters away. Detection at distances of 500 and 1100 m using a coherent laser was also performed. Calculations of detection range for typical situations indicate that detection at km distances is possible.

03170 Measurement of Characteristics of Lightning at High Altitudes. Final Report – Translation No. NASA-TM-76669. (Mesure des Caracteristiques de la Foudre en Altitude Test No. 76/650000 p.4. Final Report, Toulouse, May 1979; 74p.)

Coquelet, M.; Gall, D.
National Aeronautics and Space Administration, Washington, DC. Dec. 81; 80p.

Order as: **N82-14714/1**; PC A05/MF A01

New development in aeronautical technology the use of composite materials, new electronic components, electric flight controls -- have made aircraft potentially more and more vulnerable to the effects of lightning. In-flight tests were conducted to evaluate the current in a bolt of lightning, to measure voltage surge in the onboard circuitry and in certain pieces of equipment, and to document the relationship lightning bolt current and the voltage surge.

03171 Lightning Effects on Aircraft and Composites. Literature Study on Lightning Strikes and Protection. Advanced composite materials (Verkan AV Blixt I Flygplan och Kompositer. Litteraturstudie Oever Skador och Skydd) (Report No. FOA-C-20388-F9) *(in Swedish)*

Alm, A.
Foersvarets Forskningsanstalt, Stockholm (Sweden). *National Aeronautics and Space Administration, Washington, DC. Nov. 80; 102p.

Order as: **N82-10024/9**; PC A06/MF A01

The frequency and different types of lightning strike on different parts of aircraft and several ways of protection against direct and indirect lightning effects were reviewed. Fiber composites, lightning damage and testing of lightning protection for modern aircraft material are studied by means of simulation techniques. Unshielded composite materials are damaged by lightning. With a correctly shaped lightning shield damage can be prevented.

03172 An Operative Wind Shear and Inversion Warning System for Helsinki-Vantaa Airport

Korhonen, O.
Finnish Meteorological Inst., Helsinki. National Aeronautics and Space Administration, Washington, DC. Aug. 80; 25p.

Order as: **N81-19076/1**; PC A02/MF A01

The system has some data banking capabilities. Real time cross-sections are available in graphical or numerical form at any moment. The station is able to observe low-level wind, temperature, and humidity profiles continuously. Most data are used by the meterologist in the preparation of low-level wind shear and inversion warnings for the airport but the system is also a useful tool for weather observation, especially when where is an advection of coastal fog or low clouds.

03173 Static Charge in Aircraft Fuel Tanks (Final technical rept. 1 Jul. 77-30 Sep. 79. Nos. AFWAL-TR-80-2049; FOSR-77-33730)

Martel, Charles R.
Southampton Univ. (England). Dept. of Electrical Engineering. Air Force Wright Aeronautical Labs., Wright-Patterson AFB, OH. Sep. 80; 38p.

Order as: **AD-A093 552/8**; PC A03/MF A01

This program investigates electrostatic hazards associated with aircraft fueling. The tribo electric phenomena of reticulated polyurethane foam charging was examined using JP-4. An attempt was made to understand the basic electrostatic phenomena involved when fuel is pumped into aircraft fuel tanks containing reticulated, polyurethane foam. The investigation also involved the development and study of alternative foam materials having enhanced electrical and charge dissipation characteristics as a means of eliminating the electrostatic hazards during refueling. (Author)

03174 Tests on the Fire Resistance Behavior of Materials inside Civil Aircraft (les Essais de Comportement au Feu des Materiaux d'Interieur d'Avions Civiles) (Report No. SNIAS-801-551-101) *(in French)* **(Presented at Assoc. Des Amis de l'Ecole Natl. Super. De l'Aeron. Et de l'Espace/l'Ecole Natl. Super. Des Tech. Avancees Stage de Perfectionnement sur Mater. Aeron. M-01, 22 Jan. 1980)**

Blavy, A. A.
Societe Nationale Industrielle Aerospatiale, Suresnes (France). Lab. Central. National Aeronautics and Space Administration, Washington, DC. 22 Apr. 80; 23p.

Order as: **N81-12052/9**; PC A02/MF A01

The equipment employed to perform tests and to identify the gases released from exact replicas of cabin elements is presented. Details are given on the way in which these tests are carried out, the criteria imposed and the results obtained.

03175 Atmospheric Electricity-Aircraft Interaction (Report No. AGARD-LS-110) Lectures Held in London, 9-10 Jun. 1980, in Munich, 12-13 Jun.

1980, and in Menlo Park, Calif., 24-25 Jun. 1980)
Anon.
Advisory Group for Aerospace Research and Development, Neuilly-sur-Seine (France). National Aeronautics and Space Administration, Washington, DC. May 80; 227p.
Order as: **N80-31743/1**; PC A11/MF A01

No abstract available.

03176 Veiling Glare from Spectacles and Visors in Aviation (Report No. ARL/SYS NOTE-67)
Clark, B. A. J.
Aeronautical Research Labs. Melbourne (Australia). Apr. 79; 16p.
Order as: **AD-A089 403/0**; PC A02/MF A01

Veiling glare from surface scratches, turbidity and fluorescence in spectacles and visors may have a significant effect on the vision of pilots. The problems of measuring the stray light produced by these items are indicated, and results of some actual measurements are presented in the form of a single index for each sample uner representative conditions. Such an index may provide a way of avoiding premature replacement of expensive items, as well as indicating items which have become a flight safety hazard. The techniques appear suitable for extension to aircraft transparencies, and to related fields such as the effects of veiling glare on the vision of motor vehicle drivers. (Author)

03177 Aircraft Safety (Securite du Vehicle Aerien) (Report No. SNIAS-792-111-105) *(in French; English Summary)*
Toulouse, P.
Societe Nationale Industrielle Aerospatiale, Toulouse (France). Direction Etudes. National Aeronautics and Space Administration, Washington, DC. 13 Apr. 79; 21p.
Order as: **N80-28327/8**; PC A02/MF A01

The way in which air transportation risks are identified from both experience and analysis is described. The probabilistic approach used to decrease the likelihood of occurrence of accidents and to minimize their consequences is also described.

03178 The Strength of Occupant Restraint Systems in Light Aircraft – An Experimental Evaluation (Final rept. 1976-1978) (Report No. ARL/STRUC-375)
Sarrailhe, S. R.
Aeronautical Research Labs. Melbourne (Australia). Feb. 79; 43p.
Order as: **AD-A086 599/8**; PC A03/MF A01

The cabins and restraint systems of three cyclone-damaged light aircraft were tested statically to determine the strength of the restraint system in the cabin. It was found that most restraint components were much stronger than demanded by the 9 g requirement and it was considered that only minor improvements would be needed to ensure 25 g capability. Seats were not as strong as the restraints and their behaviour under crash load conditions requires further investigation. (Author)

03179 A Survey of the High Frequency Effects Associated with the Lightning Discharge (Report No. OUEL – 1290/79)
Braithwaite, N. S. J.; Cooke, M. J.
Oxford Univ. (England). Dept. of Engineering Science. National Aeronautics and Space Administration, Washington, DC. 1979; 47p.
Order as: **N80-23590/6**; PC A03/MF A01

The literature on high frequency effects associated with the lightning discharge is reviewed, with emphasis on the possible hazards to aircraft from electromagnetic fields. Sources of fast field changes in the cloud discharge and in the discharge to ground are considered in detail, from experimental observations of the far radiation field. Radiation from the return stroke and from K changes is most important up to 10 MHz, and breakdown processes become important at higher frequencies. An overall amplitude frequency spectrum is given. Models of the return stroke are briefly reviewed. Measurements at lightning current at ground are discussed, with the airborne survey of lightning fields conducted as part of TRIP-76.

03180 Propulsion and Energetics Panel Working Group 11 on Aircraft Fire Safety. Volume 2. Main Report (Advisory rept. No. AGARD-AR-132-VOL-2) (See also Volume 1, AD-A078 671.)
Botteri, Ben P.; Gerstein, M.; Horeff, T.; Parker, J.
Advisory Group for Aerospace Research and Development Neuilly-sur-Seine (France). Nov. 79; 171p.
Order as: **AD-A082 022/5**; PC A08/MF A01

In 1976, the Propulsion and Energetics Panel of AGARD set up its Working Group 11 on 'Aircraft Fire Safety'. The findings and recommendations of Working Group 11 are collected in this Executive Summary which forms Volume 1 of the final Advisory Report of the Working Group. Volume 2 of the same publication contains the full report of the Working Group. Besides the various recommendations on technical and operational subjects a strong proposal is included for an international cooperative effort in the field of aircraft fire safety.

03181 Propulsion and Energetics Panel Working Group 11 on Aircraft Fire Safety. Volume 1. Executive Summary (Advisory rept. No. AGAR-AR-132-VOL-1)
Botteri, B. P.
Advisory Group for Aerospace Research and Development Neuilly-sur-Seine (France). Sep. 79; 19p.
Order as: **AD-A078 671/5**; PC A02/MF A01

In 1976, the Propulsion and Energetics Panel of AGARD set up its Working Group 11 on 'Aircraft Fire Safety'. The findings and recommendations of Working Group 11 are collected in this Executive Summary which forms Volume 1 of the final Advisory Report of the Working Group. Volume 2 of the same publication contains the full report of the Working Group. Besides the various recommendations on technical and operational subjects a strong proposal is included for an international cooperative effort in the field of aircraft fire safety.

03182 Conference on Certification of Aircraft for Lightning and Atmospheric Electricity Hazards

(Conference sur la Certification des Aeronefs Contre les Dangers du Foudroiement et de L'Electricite Atmospherique) held ONERA – Chatillon (France) 14-21 September 1978 (Final rept. 1 Jul. 78-30 Jun. 79. Nos. EOARD-TR-79-6; FOSR-78-3653P)

Taillet, Joseph
Office National D'Etudes Et de Recherches Aerospatiales Chatillon-Sous-Bagneux (France). European Office of Aerospace Research and Development, FPO New York 09510. 30 Jul. 79; 230p.

Order as: **AD-A078 536/0**; PC A11/MF A01

This conference was organized to disseminate in a tutorial fashion to the NATO Air Electrical Working Party and their technical advisors the information related to the recent progress of atmospheric electricity hazards and lightning protection studies. The conference program covers the following topics: Theory of Lightning; Basis of Specification; Lightning Attachment and Swept Stroke Testing; Fuel Vapor Ignition and Direct Effects Testing; Indirect Effects Testing and Lightning Protection Methodology; Static Electricity. (Author)

03183 Wind Shear During Approach: An Investigation into the Influence of a Tower Measured Wind Environment on the Symmetric Motions of a Simulated Aircraft During an Automatic Approach (DC 9 aircraft) (Report No. NLR-TR-77078-U)

Schurring, J.
National Aerospace Lab., Amsterdam (Netherlands). Flight Div. 10 Apr. 79; 40p.

Order as: **N79-32192/3**; PC A03/MF A01

Measured wind profiles from the Royal Netherlands Meteorological Institute 200 m meteorological tower at Cabauw were used to estimate wind shear effects on the symmetric motions of an approaching aircraft. Wind profiles as well as an automatically approaching DC-9 aircraft were simulated on an electronic analog computer. The study shows that requirements for autopilots, etc., specifying only mean shear values, like the 8 km/100 ft concept (FAA), are not adequate. Simulation results and measured wind data for the year 1973 were combined to obtain statistical information on the chance of exceeding a certain deviation from the glide path during an approach. The results indicate that relatively large deviations in the aircraft flight path are related to nightly stable meteorological conditions, with low wind speeds at height of 10 m, in particular from the east or south. The largest deviations produced by the Cabauw wind profiles for 1973 did not exceed the coverage of a normal I.L.S. glide path indicator. Severe storms did not present hazardous situations in terms of vertical wind shear.

03184 The Requirement of Damage Tolerance. An Analysis of Damage Tolerance Requirements with Specific Reference to MIL-a-83444 (Report No. NLR-TR-77005-U)

Dejonge, J. B.
National Aerospace Lab., Amsterdam (Netherlands). Div. of Structure and Materials. 16 Jan. 78; 33p.

Order as: **N79-27135/9SL**; PC A03/MF A01

Various aspects of damage tolerance are discussed with specific reference to a recently issued USAF detailed damage tolerance specification. Main criteria stipulate that if a crack occurs the aircraft structure should be able to sustain a reasonably high load in cracked condition. It is concluded that USAF specifications will stimulate the development of improved manufacturing techniques, although it will tend to favor non-inspectable slow-crack propagation structures rather than easily inspectable fail-safe structures. It is also felt that USAF requirements are not well suited to civil needs.

SEE ALSO: 03121; 03156; 03162; 03168

RESCUE SYSTEMS

03185 Scientific Report (1980) of the Research Department of Flight Mechanics/Guidance and Control (Annual Report) (Original Contains Color Illustrations)

Holtz, H. J.
Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt e.V., Cologne (Germany, F.R.). National Aeronautics and Space Administration, Washington, DC. 1980; 83p.

Order as: **N81-22013/9**; PC A05/MF A01

The activities of the German Institutes for Flight Guidance, Flight Mechanics, Aerospace Medicine, and Flight Systems Dynamics are discussed together with those of the Air Transport Science Division. These activities include aeronautics, flight simulation, inflight testing, model testing in wind tunnels, research in rescue and recovery systems, low noise take-off and landing studies, helicopters, human engineering, effects of weightlessness, vacuum and great depths at sea, multibody vehicles, orbit and trajectory mechanics, error analysis, and guided missiles.

03186 Sarsat: A Rescue System for Ships and Airplanes – Translation No. NASA-TM-76391 (Sarsat, Ein Rettungssystem fuer Schiffe und Flugzeuge Rept 80-054 (Germany, F.R.). 1980; p. 1-14. Original Language Document Was Announced as A80-46302)

Anon.
National Aeronautics and Space Administration, Washington, DC. Oct. 80; 19p.

Order as: **N81-20103/0**; PC A02/MF A01

The SARSAT rescue system is described and alternative systems discussed, with SARSAT functioning as either independent satellite within an emergency call system or as an additional search and rescue payload of another satellite system. Geostationary and polar orbits are compared. A low cost SARSAT rescue system utilizing four satellites in a quasi solar, sun synchronized orbit at 1000 kilometers is proposed. Three multiple start satellites in a 57 degree orbit, with a fourth satellite in reserve at a lower orbit are described. Alternative transport systems are discussed and a recommended time table from project approval to launch is given.

03187 Applications of Pyrotechniques in Aviation (Des Applications de la Pyrotechnie dans le Domaine

Aeronautique) (Report No. SNIAS-792-422-103) *(in French)* **(Presented at Congr. On Explosifs et Pyrotech.: Appl. Spatiales, Toulouse, 22-25 Oct. 1979)**

Morlan, S.

Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). National Aeronautics and Space Administration, Washington, DC. 1979; 6p.

Order as: **N81-10025/7**; PC A02/MF A01

The cutting of canopies and windows in aircraft to permit abandonment in emergencies is discussed. The advantages of pyrotechnic logic circuits are presented. The use of pyrotechnics for opening cabin windows in a prototype Corvette aircraft is illustrated. Possible applications for assisting in ground evacuations in civilian transport aircraft are mentioned.

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